MACHINERY ISSUE

THE IRON TRADE REVIEW

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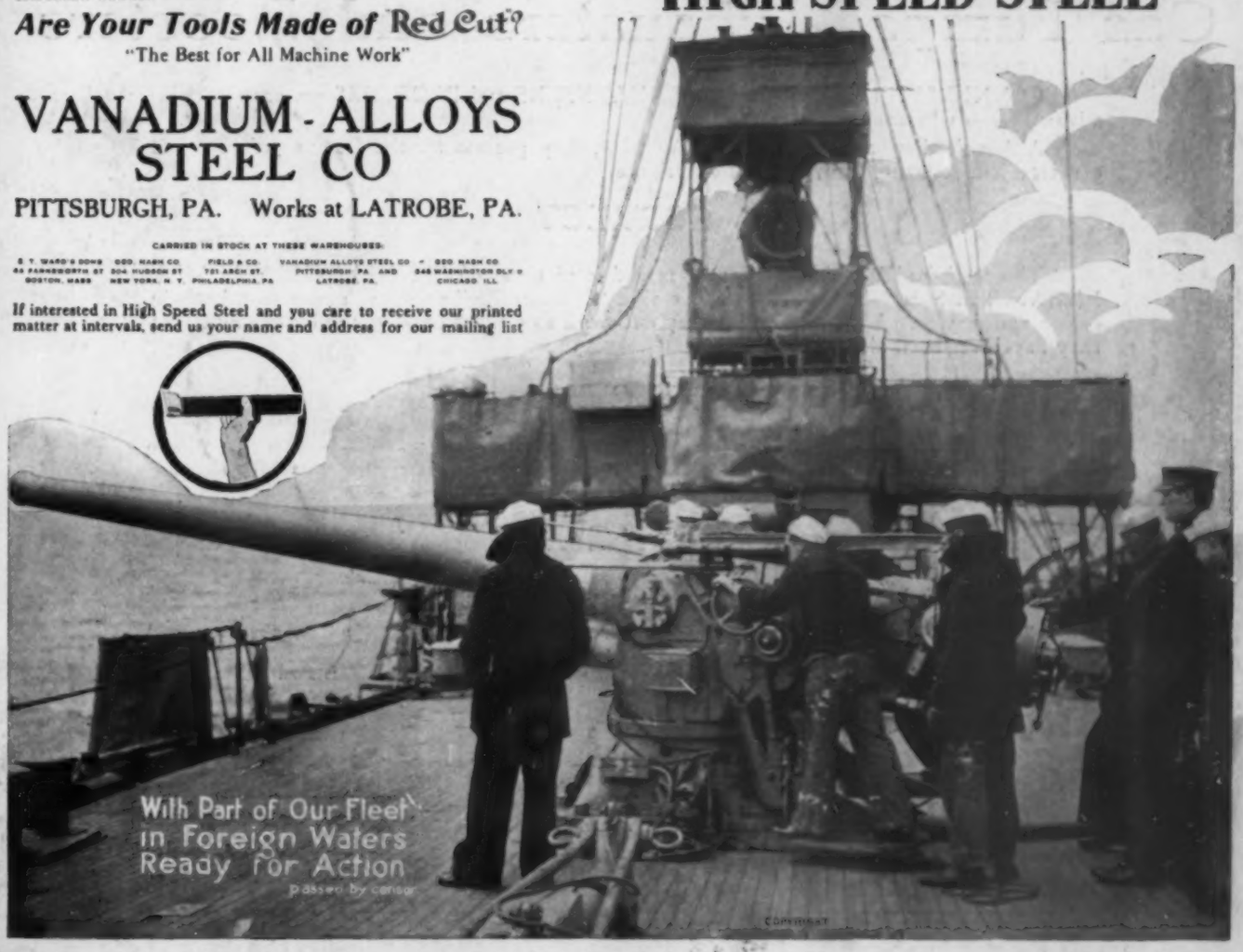
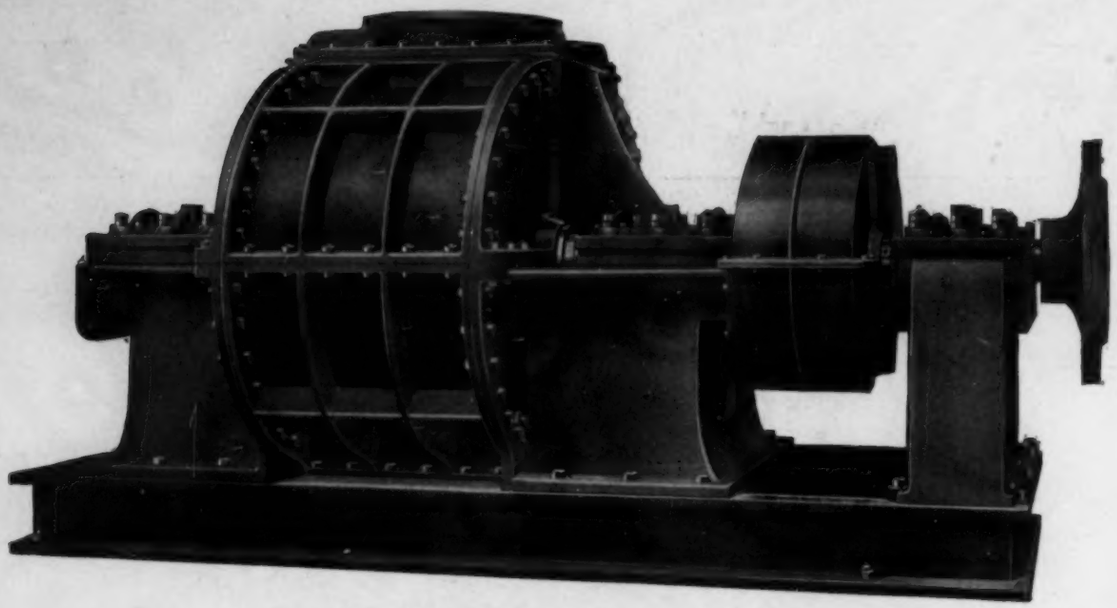


Advertisers' Index, pages 206-207. Contents, page 111. "Where-to Buy," page 122.
Engineering Directory, pages 170-171. Classified Advertisements, pages 182-205.



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NEW YORK
114 Liberty St.

THE IRON TRADE REVIEW

Vol. LXII Cleveland, February 7, 1918 *No. 6*

Production Loss Raises Problems

Readjustments Being Forced That Vital Business May Be Safeguarded—Navy Disregards Recommended Prices and Takes Competitive Bids on Steel —Doubt Overhanging Ore Contracts to be Lifted

PRODUCTION loss in iron and steel from violent storms and transportation blockades still is mounting. In its wake are pressing forward more insistently the inevitable problems of readjustment of output and distribution in order that urgent business may not suffer. The contraction of supplies promises to increase the difficulties of the nonessential consumer. Operations have recovered little of the ground lost in recent weeks. Blast furnaces, open hearth and coke oven activities in the Greater Pittsburgh and valley districts remain at 60 to 65 per cent. Eastern works are running at from 50 to 65 per cent. The deep cut in January's production is expressed by the monthly loss of 489,297 tons, or 16.5 per cent in pig iron. The January output of 2,396,083 tons was 802,514 tons less than in November. The shrinkage is emphasized by the 77,292 tons daily average in January against 93,077 tons in December and 106,620 tons in November.

War Needs Direct Iron

The recent slump of pig iron production has pointed more clearly the strong drift of distribution into channels dictated by war requirements. The position of consumers of nonessential lines gradually is being rendered more difficult. The growing shortage of purchasable steelmaking metal represents a more insistent problem. It is estimated in some quarters that sales of 500,000 tons of future basic could be made if the iron were to be had. A new northern Ohio steel plant has made arrangements to supply last half needs placed at about 50,000 tons. Much malleable inquiry also is unsatisfied. Selling for delivery after July 1 continues to go forward more briskly. The General Electric Co. has closed a round tonnage for foundry and malleable for third quarter. A Chicago large machinery interest wants 12,000 tons. The rigid phosphorus specifications of the government for ordnance castings conflict with the limited supply of standard low phosphorus iron. Some modification of standards to insure production is necessitated. The Bethlehem Steel Co., itself a producer of copper-bearing metal, is seeking 10,000 to 15,000 tons of standard grade.

To Clarify Ore Doubts

Contract deliveries beyond March 31 continue a subject of deep interest to the industry in view of the provision for price revision by authorized government agency stipulated by the President's declaration of Dec. 28. The uncertainty over the status of the usual 12-month contracts which has been disturbing the iron ore trade is expected to be dispelled soon by an interpretation of the President's statement which is to be put out through the general committee of the American Iron and Steel institute. This matter was considered at a conference of ore interests at New York the past week. The imperative necessity of stabilizing ore operations for the coming season as a foundation for all war preparations, is being given full weight. A new form of revision clause adopted by some of the pig iron makers provides that deliveries after March 31 shall be at the government price in effect at the time of shipment, but if federal price supervision ends before the contract is terminated, the unshipped balance shall revert to the original price. Southern furnaces are providing for a privilege of cancellation for themselves should the government price on future tonnage prove unsatisfactory to them.

Navy Ignores Fixed Prices

A new situation which may have an important bearing on the whole present system of federal price determination has been precipitated by the free lance action of the navy department. Competitive bids have been taken on a number of steel products and some quotations considerably under the maximum prices recommended on these lines by the committee on steel and steel products of the American Iron and Steel institute have been developed. Such a course of procedure may serve to bring to a clean cut issue the future functions of the war industries board on matters of price and distribution.

The Iron Trade Review

EDITORIAL

Sane Standards Become a Necessity

NOW that the nation fast is approaching the close of the first year of the war, evidence of the unpreparedness of the country and the clumsy, though sincere, efforts of the government to expand its war organization on the unprecedented scale required, constantly are coming to light. Critics are appearing and some genuinely constructive advice and suggestions are being advanced. Insofar as the prime essentials of the war are concerned, great efforts are being made to increase their output, and above all, to eliminate some of the absurd specifications which have been put forth by certain governmental departments.

Parts for engines or other government work are undergoing an unusually severe inspection. As an illustration, one company which has an order for nearly 100,000,000 parts for Liberty motors, has been obliged to cut its output of various screws and bolts for these motors from 8000 to 1500 per machine daily, in order that the variation in screw pitch be less than 0.001 inch. These limits also apply to the shoulders. As a result, the screws are finished almost to watch-works standards, the production is greatly restricted, the cost is increased and the finished article is given no added value for service. Severe requirements such as these are highly desirable for some motor parts, but the idea that every motor part should be finished to the same standard is nonsensical. It is estimated that after the great precision made necessary in cutting, over 25 per cent of the finished product is rejected in the final inspection at this plant.

Less attention to minor details and greater concentration on important features are more desirable. An incident occurred at the same plant which illustrates this point. Approximately $400,000 worth of steel screws were cut in various lengths according to government specifications. These requirements specified A. L. A. M. standard threads. The screws were cut and shipped but upon the arrival of the lot at its destination, it was found that a government official had erred and that the screws should have been cut according to metric standards. Obviously, this lot was almost an entire loss to the government as the screws were of odd lengths and could not be utilized for other purposes without recutting and rethreading.

One company in the United States which had approximately 200,000 English shells on hand that had failed to pass inspection found that the Lloyd George ministry differed from the old regime in that logical precision limits and inspection methods were introduced. These shells had been accurately finished on the circular rings that bear on the rifling of the gun, but were not finished within such close limits on the intervening shell body. The Lloyd George ministry recognized the uselessness of giving the unimportant parts of the shell more than a roughing cut, the shells were accepted, and the ministry made one of the first of its great steps in injecting engineering logic into the determination of shell specifications.

New standards modeled on this plan are sure to be formulated in time for government work in the United States. It is highly advisable, in view of the urgent need for war materials at present, that production be given the added impetus to be derived from sane standards for work of this kind, just as quickly as the mental or physical transformation can be brought about.

Give Attention to the Terminals

THE appeal for increased terminal facilities, which has become almost legendary in its origin, has been revised and brought up to date by a prominent New York shipper. In a recent letter to W. G. McAdoo, director general of railroads, he proposes a plan which, by virtue of its timeliness and application to present conditions, is worthy of the utmost consideration at Washington.

The plan in brief calls for the establishment of freight yards on all main lines, not more than one hour's freight distance from Atlantic terminals. Sheds, with railroad track on one side and wagon road on the other, would be built by cantonment camp builders. Whenever necessary, during labor shortage, soldiers would be detailed to load and unload, following the precedent of foreign countries. The two principal uses of the yards would be to receive all export freight, whenever ships would not be immediately available, and to handle whenever necessary, all nonperishable freight for domestic commercial consumption.

As has long been realized, terminal facilities have been inadequate, even in normal times. Their inability to cope with present demands created by war is reflected by the heavy congestion all along the Atlantic seaboard, which has been steadily working its way back through the west, threatening widespread disorganization of industry. Not-

The Iron Trade Review

EDITORIAL

withstanding more favorable weather conditions, this freight congestion with present facilities is likely to continue in greater or lesser degree, owing to the rapidly increasing production of munitions and supplies of all descriptions. Due chiefly to the financial expenditure involved in such expansion, the railroads have been able to do little to prepare for the handling of this business. Now, with the government in charge, the sorely needed attention to terminal betterments could be made expeditiously, and the cost involved in some such plan as that outlined would be trifling in comparison with the damage now being done to business and military efficiency.

Does Labor Play a Fair Game?

THE labor unions of this country, it is estimated, collect over $50,000,000 annually in monthly dues from their members. A small amount of money paid every 30 days by individual members is not much of a factor in itself and probably it works no hardship on the workingman. The aggregate, however, is an immense sum. What is done with this money? What benefit does the workingman gain and how much goes to pay high salaries to professional agitators, walking delegates and other officers, to say nothing of the sums expended in court actions including, as it has been proven, the defense of dynamiters and other offenders of the criminal law.

The federal government has in numerous instances forced manufacturers to disclose private information regarding receipts and disbursements. Why should not the labor unions be compelled to do likewise? Some of the workingman's hard-earned money may be and undoubtedly is being absorbed in plain out-and-out graft. Since publicity is the greatest corrective and preventative of graft, it should be able to perform a similar service for the workman as regards the inner workings of his labor organization.

The Supreme Court of the United States undoubtedly has the power to compel the unions to divulge this information. It is doubtful, however, whether steps ever will be taken along these lines because the lawmakers, as a class, fear the vote of labor, while the manufacturer, as far as political matters are concerned, is well-nigh helpless. The old adage that it is a poor rule that won't work both ways certainly is applicable to capital and labor.

War Function of Machine Dealer

LETTERS recently sent out by the machine tool section of the finished products division of the war industries board have aroused much interest in the machinery trade. These letters were sent out to dealers and brokers of machine tools who have been advertising lists of tools for sale in various trade papers and have enclosed to each seller his respective advertisement. The text of the communication follows:

"This department requires accurate information regarding available machine tools, in order to provide for the needs of the government. In order, therefore, to avoid confusion resulting from the duplicate listing of machines, you are requested to check on the enclosed copy of your advertisement all such machines as you actually own and have in stock for immediate delivery, and to advise where they can be inspected and price asked."

In other words, the machine tool section wants to deal directly with the owners of the machines advertised, perhaps to save time, possibly to avoid paying an extra profit. Some dealers never advertise machines which they do not own and these, of course, will not be affected in any way by this request. However, there are undoubtedly many duplications appearing in the advertising columns, occurring when two or more sellers may have knowledge of and a price quoted upon the same machine.

The machine tool section may be successful in eliminating some of these duplications by its present procedure, but in many cases the government probably will continue to deal through middlemen. Frequently machines are advertised by dealers who do not own them, but which they have located in some out-of-the-way place, where the holder has not thought it worth his while to offer his single machine on the market. For example, perhaps a dealer has learned of a boring mill in a small middle western town. He obtains a price on this machine from its owner and lists it among other machines he is advertising. He cannot check this item as the machine tool section requests. Yet if the government wants this tool urgently, it must come to him and pay him a commission. At a time when machine tools are of vital importance in the government's war preparations, in unearthing this machine the dealer thus has performed a unique service. He has assisted in mobilization of machine tools as truly as has any manufacturer.

Iron and Steel Prices

Corrected to Wednesday Noon

SCRAP, WAREHOUSE AND IRON ORE PRICES ON PAGE 404

PIG IRON

Bessemer, valley	$36.30
Bessemer, Pittsburgh	37.25
Basic, Pittsburgh	33.95
Basic, eastern Pa.	33.00
Basic, Buffalo	33.00
Malleable, Pittsburgh	34.45
Malleable, Chicago	33.50
Malleable, Philadelphia	34.00 to 37.50
Malleable, Buffalo	33.50

GOVERNMENT SCHEDULE

1.75 to 2.25 silicon (No. 2 foundry, No. 2 plain, and No. 3 southern)	$33 furnace base
2.25 to 2.75 silicon (No. 2X, No. 1 Northern foundry, and No. 2 southern)	base plus 50c
2.75 to 3.25 silicon (No. 1X No. 2 soft)	base plus $1.50
Over 3.25 silicon	$34.50, plus $1.00 for each ½ per cent of silicon.
No. 1X, Phila.	35.25 to 35.50
No. 2 foundry, Pittsburgh	33.95
No. 2 foundry, Cleveland	33.95
No. 2 foundry, Ironton	33.00
No. 1 foundry, Chicago	33.50
No. 2 foundry, Chicago	33.00
No. 2X foundry, Phila.	34.25 to 34.50
No. 2X foundry N. J. tide.	34.25 to 34.50
No. 2X foundry, Buffalo	33.50
No. 2 plain, Philadelphia	33.75 to 34.00
No. 2 plain, N. J. tide	33.75 to 34.00
No. 2 southern Birmingham	33.00 to 33.50
No. 2 southern, Cincinnati	36.40
No. 2 southern, Chicago	37.50
No. 2 southern, Phila. del.	38.30 to 39.40
No. 2 southern, Cleveland	37.50
No. 2 southern, Boston	39.50
No. 2 southern, St. Louis	35.90
Virginia, No. 2X, furnace	33.50
Virginia, No. 2X, Phila.	36.77
Virginia, No. 2X, Jersey City	37.02
Virginia, No. 2X, Boston	37.27
Gray forge, Pittsburgh	32.95
Silveries, 8 per cent, furnace	46.00
Silveries, 8 per cent, Chicago	48.54
Low phos. standard, Phila.	55.00 to 56.00
Low phos., Lebanon furnace	50.00
Low Phos., Piittsburgh	53.00
Charcoal, Superior, Chicago	37.50
Charcoal, Superior, Buffalo	39.75
Charcoal, southern furnace	43.00

COKE

(At the ovens.)

Connellsville furnace	$6.00
Connellsville foundry	7.00
Wise county furnace	6.00
Pocahontas furnace	6.00
New River foundry	7.00
New River furnace	6.00
Wise county foundry	7.00

FERRO ALLOYS

Ferromanganese, delivered	$250.00 to 255.00
Spiegel, 20 per cent fur.	60.00
Spiegel, contracts, furnace	58.00
Ferrocarbon titanium, carloads, maker's plant	160.00
Ferrosilicon, 50 per cent, Pittsburgh	175.00 to 180.00
Ferrosilicon, 50 per cent, Pitts., 1st quarter	170.00 to 175.00
Bessemer ferrosilicon, 9 per cent.	$54.00
Bessemer, ferrosilicon, 10 per cent.	55.00
Bessemer ferrosilicon, 11 per cent.	58.30
Bessemer ferrosilicon, 12 per cent.	61.60

Ferrosilicon prices at Ashland, Ky., Jackson and New Straisville, O.

SEMIFINISHED MATERIAL

BILLETS

Open hearth, Pittsburgh	$47.50
Open hearth, Philadelphia	50.50
Open hearth, Youngstown	47.50
Bessemer, Pittsburgh	47.50
Bessemer, Youngstown	47.50
Forgin, Pittsburgh	60.00
Forging, Philadelphia	63.00

SHEET BARS

Open hearth, Pittsburgh	$51.00
Open hearth, Youngstown	51.00
Bessemer, Pittsburgh	51.00
Bessemer, Youngstown	51.00

WIRE RODS AND SKELP

Wire rods, Pittsburgh	$57.00
Grooved skelp, Pitts.	2.90c
Sheared skelp, Pitts.	3.25c

SHAPES, PLATES AND BARS

(In cents per pound)

Structural shapes, Pitts	3.00c
Structural shapes, Phila.	3.185c
Structural shapes, N. Y.	3.195c
Structural shapes, Chicago	3.00c
Tank plates, Chicago	3.25c
Tank plates, Pittsburgh	3.25c
Tank plates, Philadelphia	3.435c
Tank plates, New York	3.445c
Bars, soft steel, Pittsburgh	2.90c
Bars, soft steel, Chicago	2.90c
Bars, soft steel, New York	3.095c
Bars, soft steel Phila.	3.085c
Bar iron, Chicago	3.50c
Bar iron, Phila.	3.50c to 3.685c
Bar iron, Cleveland	3.64c to 3.70c
Bar iron, New York	3.695c
Bar iron, Pittsburgh	3.50c
Hard steel bars, Chicago	3.00c
Cotton ties, Pitts., Jan.	$2.18

RAILS, TRACK MATERIAL

Angle bars, Pittsburgh base	3.25c
Angle bars, Chicago base	3.25c
Standard bessemer rails, mill	$55.00
Stand. open hearth rails, mill	57.00
Light rails, 25 to 45, mill	3.00c
Relaying rails, light, St. L.	75.00 to 80.00
Spikes, railroad, Pitts.	3.90c
Track bolts, Pittsburgh	4.90c
Track bolts, Chicago	4.90c
Tie Plates, Chicago	3.25c

WIRE PRODUCTS

(Per 100 lbs. to jobbers; retailers 5c more)

Wire nails, Pittsburgh	$3.50
Coated nails, Pittsburgh	3.45
Plain wire, Pittsburgh	3.25
Galvanized wire, Pittsburgh	3.95
Polished staples, Pittsburgh	3.65
Galvanized staples, Pittsburgh	4.35
Barb wire, painted, Pitts.	3.65
Barb wire, galvanized, Pitts.	4.35
Cut nails, Pittsburgh	4.00

CHAIN, PILING, STRIP STEEL

(In cents per pound)

Chain, ⅜ in proof coil, Pitts	8.00c
Sheet piling, base, Pitts.	4.00c to 5.00c

Cold rolled strip steel, hard coils, 1½ inches and wider by 0.100 inch and heavier, base per 100 pounds, 6.50c.

Market Report Index

	Page
Weekly Market Review	349
Pig Iron	353
Coke	355
Scrap	356
Semifinished Steel	357
Ferroalloys	358
Bars	358
Nuts, Bolts, and Rivets	358
Plates	359
Sheets	362
Tin Plate	362
Iron Ore	362
Structural Shapes	363
Merchant and Cast Pipe	363
Rails, Cars, and Track Materials	364
Nonferrous Market	364
Coke By-Products	389
Machinery Review	393

SHEETS

(In cents per pound)

SHEET MILL BLACK

No. 28, open hearth, Pitts.	5.00c
No. 28, bessemer, Pitts.	5.00c
No. 28, open hearth, Chi.	5.215c

TIN MILL BLACK

No. 28, open hearth, Pitts.	5.00c
No. 28, bessemer, Pitts.	5.00c

GALVANIZED

No. 28, open hearth, Pitts.	6.25c
No. 28, bessemer, Pitts.	6.25c
No. 28, open hearth, Chi.	6.465c

BLUE ANNEALED

No. 10, open hearth, Pitts.	4.25c
No. 10, bessemer, Pitts.	4.25c
No. 10, open hearth, Chic.	5.715c to 6.215c
No. 10, open hearth, Phila	4.435c

TIN PLATE

(Per 100 lb. box)

Tin plate, coke base, Pitts.	$7.75

IRON AND STEEL PIPE

Base Pittsburgh

Base Pittsburgh	Black Per cent off	Galv. Per cent off
¼ to 3 in., butt, steel	51	37½
¾ to 3 in., butt, iron	33	17

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	.30
Iron, 3½ to 4½ inches, c. l.	.12½

CAST IRON WATER PIPE

(Class B Pipe.)

Four-inch, Chicago	57.30
Six-inch and over, Chicago	54.30
Four-inch, New York	58.35
Six-inch and over, N. Y.	55.35
Four-inch, Birmingham	52.00
Six-in. and over, Birmingham	49.00

HOOPS, BANDS, SHAFTING

Class A pipe is $1 higher than Class B.

Hoops, Pittsburgh	3.50c
Bands, Pittsburgh	2.90c
Shafting, Pitts., carloads	17 off to list

RIVETS

Structural rivets, Pittsburgh	4.65c
Boiler rivets, Pittsburgh	4.75c
Rivets ⅞ in. and smaller, Pitts.	45 and10 off

NUTS AND BOLTS

(Delivered within 20-cent freight radius)

CARRIAGE BOLTS

(⅜ x 6 inches, smaller and shorter)

Rolled thread	50–5 off
Cut thread	40–10–5 off
Larger and longer	40 off

MACHINE BOLTS

(⅜ x 4 inches, hot pressed nuts)

Rolled thread	50–10–5 off
Cut thread	50–5 off
Larger and longer	40–10 off
Cold pressed semi-finished hexagon nuts ⅜ in. and larger	60–10–10 off
Cold pressed semi-finished hexagon nuts ⅞ in. and smaller	70–5 off
Gimlet and cone point lag screws	50–10 off

NUTS

Hot pressed, square blank	2.50c off
Hot pressed, square tapped	2.30c off
Hot pressed, hexagon blank	2.30c off
Hot pressed, hexagon tapped	2.10c off
Cold pressed, square blank	2.25c off
Cold pressed, square tapped	2.00c off
Cold pressed, hexagon blank	2.25c off
Cold pressed, hexagon tapped	2.00c off

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products February 6, average for January 1918, average for November 1917, and average for February 1917. Prices are those ruling in the largest percentage of sales at the dates named

	Prices Feb. 6, 1918.	Average prices Jan., 1918	Nov., 1917	Feb., 1917
Bessemer pig iron, Pittsburgh..	$37.25	$37.25	$37.25	$35.95
Basic pig iron, Pittsburgh....	33.95	33.95	33.95	30.95
*No. 2 Foundry pig iron, Pitts.	33.95	33.95	33.95	33.95
*No. 2. Foundry pig iron, Chi.	33.00	33.00	33.00	31.25
Lake Superior charcoal, Chicago	37.50	37.50	37.50	34.50
Malleable, Chicago	33.50	33.50	33.50	31.25
**Southern, No. 2, Birmingham.	33.50	33.50	33.50	24.50
*Southern Ohio No. 2, Ironton	33.00	33.00	33.00	33.00
Basic, eastern Pa.....	33.00	33.00	33.00	30.50
**No. 2X Virginia, furnace....	33.50	33.50	33.50	29.00
**No. 2X foundry, Philadelphia	34.25	34.25	34.00	32.00
Ferro mang., delivered.....	250.00	250.00	247.00	265.00
Bessemer billets, Pittsburgh....	47.50	47.50	47.50	62.50
Bessemer sheet bars, Pittsburgh	51.00	51.00	51.00	62.50
Open hearth sheet bars, Pitts..	51.00	51.00	51.00	62.50
Open hearth billets, Pitts.....	47.50	47.50	51.00	62.50
Steel bars, Pittsburgh.....	2.90	2.90	2.90	3.00
Steel bars, Chicago.....	2.90	2.90	2.90	3.15
Iron bars, Philadelphia.....	3.50	3.648	4.335	3.259
Iron bars, Cleveland.....	3.64	3.64	4.00	3.00

*1.75 to 2.25 silicon. **2.25 to 2.75 silicon.

	Prices Feb. 6, 1918.	Average prices Jan., 1918	Nov., 1917	Feb., 1917
Iron bars, Chicago mill.....	3.50	$3.50	$4.10	$3.00
Beams, Chicago.....	3.00	3.00	3.00	3.38
Beams, Pittsburgh	3.00	3.00	3.00	3.25
Beams, Philadelphia	3.185	3.185	3.185	3.509
Tank plates, Pittsburgh	3.25	3.25	3.25	3.75
Tank plates, Chicago	3.25	3.25	3.25	3.94
Tank plates, Philadelphia ...	3.435	3.435	3.435	5.009
Sheets, blk., No. 28, Pitts....	5.00	5.00	5.30	4.56
Sheets, blue anld., No. 10, Pitts	4.25	4.25	4.60	4.37
Sheets, gal., No. 28, Pitts... ..	6.25	6.25	6.50	6.50
Wire nails, Pittsburgh.....	3.50	3.50	3.50	3.00
Connellsville fur. coke.....	6.00	6.00	6.00	8.00
Connellsville fdy. coke.....	7.00	7.00	6.60	6.50
Heavy melting steel, Pitts.....	30.00	30.00	29.60	21.87
Heavy melting steel, eastern Pa.	30.00	29.80	27.50	20.50
Heavy melting steel, Chicago.	30.00	29.70	28.50	21.65
No. 1 wrought, eastern Pa....	35.00	35.00	35.70	27.00
No. 1 wrought, Chicago.....	35.00	35.00	35.00	27.00
Rerolling rails, Chicago.....	35.00	35.30	35.70	25.63
Car wheels, Chicago.....	30.00	30.40	27.50	18.31

(For Additional Prices See Page 404)

Last Half Iron Selling More Active

Adoption of Various Forms of Contracts Covering Future Deliveries Subject to Price Revision Stimulates Business—Basic Shortage Becoming More Insistent Problem—War Needs More Closely Directing Distribution

Chicago, Feb. 5.—Almost all consumers of pig iron in the Chicago district are putting out inquiries and covering for their requirements for last half delivery. Some smaller producers have allotted practically all their production for that period and the principal interest has covered about half its tonnage for the last six months of the year. Indications are that practically its entire production for 1918 will be under contract before the end of February. One large machinery manufacturer has put out an inquiry for about 12,000 tons of various grades, including 2500 tons of malleable for first half, and the remainder for last half. Some consumers having plants in various parts of the country have met practical inability to obtain further iron in the east and have sought to cover their requirements from western furnaces. The latter are following the rule of caring for their regular customers in this territory and have no iron for distant shipments. Lake Superior charcoal-iron makers have not yet begun to sell freely for last half delivery, although there is considerable inquiry and probably these books will not be opened for some time. Low phosphorus pig iron is difficult to obtain, and inasmuch as the government requirement for this iron calls for phosphorus 0.035, the supply which will meet this analysis is not large. It is understood the Bethlehem Steel Co., itself a large producer of copper-bearing low phosphorus iron, is in the market for 10,000 to 15,000 tons of standard grade. Silveries are most difficult to obtain and one Jackson county interest reports that considerable of its output has been commandeered by the government, and it is unable to quote at present, because further requisitioning is expected. Some bessemer silicon of 10 to 12 per cent silicon content has been sold recently by one Jackson county producer.

Market Badly Upset

Boston, Feb. 4.—Business in pig iron continues on a pretty moderate scale in this territory. This condition cannot be charged to a lack of needs but rather to the many obstacles that block trading. In the first place there is the lack of production at the furnaces, because of insufficient coke supplies and makers are not inclined to take orders they cannot fill. Then there is the matter of the government price clause in contracts made for delivery after March 31. If there was a certainty that present prices would be maintained, the furnaces could go ahead in confidence. There are embargoes on all the railroads entering New England that shuts out iron to all except those plants engaged on government work and even in these instances deliveries are not all that could be desired. The coal situation is worse rather than better. Actually there probably never before was such a combination of circumstances leading to utter stagnation as now besets the local trade. But through all its perplexities the trade maintains a cheerful mien and is hopeful that eventually conditions are going to improve. Some inquiries are reported for second half iron but not much has been done except by the Buffalo makers, who withdrew from the market after booking all the business it wanted. Some business is reported

in coke for last half delivery, the New England Coal & Coke Co. having opened its books for half or all year contracts beginning July 1. The business is at the price fixed by the government for this territory.

More Second Half Selling

New York, Feb. 4.—Willingness to sell second half pig iron on the government price revision basis has been signified during the past week by several eastern Pennsylvania furnaces. The volume of such business, however, has been much smaller than in previous weeks, due to the withdrawal of an important producer now in this immediate district, who recently booked large second half tonnages. An Alabama furnace which booked several thousand tons practically now is out of the market. Most of the second half iron placed during the past week was taken by three eastern Pennsylvania and two western Pennsylvania furnaces which sold in this district an aggregate of 20,000 to 25,000 tons of foundry. This iron is to be billed at the government price prevailing at the time of shipment. In most cases, however, a clause was inserted in the contract that the sale is to be void in case the government price is made lower than the furnace's cost of production. At least 25,000 tons of foundry iron are involved in current inquiries. The major portion of this tonnage is for second half. Although practically all furnaces last year sold less than they figured on producing over the first half of 1918, few of them foresaw the obstacles to continuous production which the winter has brought about. As a result, eastern furnaces not only are unable to offer spot lots, but in most cases they are so far behind on deliveries that it will be well into the third quarter before they have completed these. The Worthington Pump & Machinery Corp. inquiry for 7500 tons for second half steel is open.

Much Basic is Wanted

Philadelphia, Feb. 5.—Selling of pig iron for delivery over the last half of 1918 continues to expand although not all the producers in eastern Pennsylvania yet are participating in this movement. The position of those who are holding off relates mainly to their uncertainty over contracts which carry deliveries after March 31. Sales of the week include some thousands of tons of second half foundry which were made by one or two eastern Pennsylvania and three western Pennsylvania furnaces. New inquiry in this territory has been showing some shrinkage except in basic. In this grade over 100,000 tons could be sold if the iron was to be had. Numerous sales of copper-bearing low phosphorus iron have been closed, some with consumers as far west as Chicago. This grade of iron is not so plentiful as has been the case recently. The General Electric Co. has been an inquirer in this territory for third quarter foundry and malleable for various plants and has placed considerable tonnage.

Production Still Hampered

Buffalo, Feb. 5.—Furnace men take a rather pessimistic view of the present situation in pig iron, because operating difficulties are so hampering production. Coke is extremely difficult to obtain. Traffic congestion militates against prompt shipment of iron as it does against prompt receipts of coke. Coupled with these drawbacks, cold weather has seriously interfered and most furnacemen believe the situation cannot clear until conditions moderate. One interest has been unable to obtain cars and is piling iron. Even foundries with war orders are unable to get sufficient iron to supply requirements. Little effort is being made to go after future business. Some third quarter and last half sales are noted with the proviso that the government price on the day of shipment is to govern, in all cases except where it has been specifically agreed that if the government price is lower than the present price, the remainder of the contract is to be cancelled. An interest representing a leading producer states that it dare not take on new business when already more iron has been sold for first half than can possibly be made. A third interest has slowed down three of its furnaces to half speed because of poor coke receipts.

Transportation Ruling Factor

Cincinnati, Feb. 4.—Both pig iron and coke are so dependent on transportation that a comprehensive report cannot be made just now without handling the two jointly. The slow shipment of furnace coke has caused a very marked reduction in the production of iron in nearly all districts. An exception may be noted of the south where ore and coke supplies do not require long hauls.

Buying Largely Extended

St. Louis, Feb. 2.—Purchasing of pig iron in this district has assumed formidable proportions. Consumers seem impressed with the view that if they do not cover, and cover soon, they will be left outside later. Agreement as to contract form and the government clause has lifted the last barrier. Inquiries, orders and actual future transactions indicate expectation of a record business in finished materials this year. Everyone who has iron to sell is besieged, and representatives of leading eastern and northern producers have for the most part disposed of their quotas and are endeavoring to induce their principals to allow them more.

Difficult to Fill Needs

Cleveland, Feb. 5.—Consumers of certain grades of pig iron, especially basic and in a lesser degree, malleable, continue to find it a difficult problem to provide for their future needs. The basic situation gives signs of becoming increasingly severe, as makers say it is impossible to provide for all wants now in sight. Various steelmakers who draw upon the northern Ohio and valley producing districts have been taking advantage of every means possible to fortify themselves. It is known that some arrangements for supplies have been made with certain furnaces not all of which have not been made public. This applies in the case of a new Lorain, O., consumer. It develops that the basic which this interest will receive from Chicago is for second quarter and not for last half, as previously reported. The last half needs approximating 50,000 tons practically all have been provided for with nearby furnaces. This buyer still wants second quarter tonnage as do various other steel plants in northern Ohio and surrounding districts. The uncovered needs are large especially for last half. It is reported a Massillon, O., user has arranged for additional tonnage. Large users of malleable have found some regular sources of supply closed through the switching of output and are trying to make new connections. One pending inquiry of this grade calls for 9000 tons. The General Electric Co. has been a large buyer of third quarter foundry and malleable for various plants. It is known to have placed around 10,000 tons and still is buying. The Westinghouse Electric & Mfg. Co. wants an indefinite tonnage for Nos. 1, 2 and 3 last half foundry for Cleveland. General inquiry remains large, but sales are being restricted by makers. Alabama sales of the week in this district were 3500 tons. One maker is shipping to Cleveland by way of St. Louis. Further allocations of government orders have been made. New inquiries include 400 tons of additional foundry for the Brooklyn navy yard, making 1300 tons in all; 300 tons of prompt foundry for Mare Island and 430 tons of February-April charcoal for St. Louis delivery. A Bay City, Mich., requirement of 1200 tons of foundry now is out in official government form. Furnace in-

terests are adopting various clauses to cover the condition of possible price revision in deliveries after March 31. An interesting form put into effect by one producer provides for invoicing at the government price at time of shipment, but if any unshipped tonnage should remain when federal market control ends, the price on this balance will be re-established at the original figure, most probably at the price of $33, furnace, base, under present conditions.

Large Tonnage for Last Half Sold

Pittsburgh, Feb. 5.—Merchant furnace interests are booking tonnages for last half shipment more freely. While it is the policy of most producers not to actively solicit business for this delivery, they are taking care of the requirements of regular customers as far as possible, and the commitments made in this district during the past week run into a large quantity. The form of contract adopted by one large producer provides that prices are subject to revision after March 31 by an authorized governmental agency. Another large producer is taking tonnages on a contract providing that in the event there is no government price or should federal regulation end, the levels to prevail shall be the maximum prices in effect at the time the contract was made. The severe weather does not offer any encouragement to blast furnace operations, which remain about the same today as they were one week ago. It is estimated that the output of pig iron in the greater Pittsburgh district is about 60 per cent of capacity. The coke supply has been almost entirely shut off by the storms and cold weather. Some furnace operations are virtually on a day-to-day basis. The Carnegie Steel Co. has added one stack to its active list so that it now has 31 out of 59 in operation. Inquiries for last half shipment are numerous. The Westinghouse Electric & Mfg. Co. has put out inquiries for this delivery for Nos. 1, 2 and 3 foundry iron and also for bessemer. Another consumer has taken 5000 tons of foundry iron for last half. Monthly averages of valley bessemer and basic in January were at the agreed levels, or $36.30 and $33, furnace, respectively, according to W. P. Snyder & Co. Only 2500 tons of bessemer iron were sold in Pittsburgh and the valleys during the entire month of January. This was to a Youngstown consumer. The only basic transaction of importance was the previously reported sale of 36,000 tons by a valley producer to an Erie, Pa., consumer.

Coke Situation Paralyzed

Continuing Severe Weather Ties Up Railroad Equipment in Connellsville Region— Frick Company Now Exchanging Fuel to Cut Hauls

Pittsburgh, Feb. 5.—Recurrence of severe weather conditions has completely shut off shipments of coke in the Connellsville region. The motive power has been crippled greatly, frogs and switches have become frozen and cars stuck to tracks. Laborers have been unable to withstand the extreme cold and this has reduced the output. The car supply was about 40 per cent yesterday and there were practically no available empty cars for loading today. Some loaded cars have been standing in the region for a week and even as long as 10 days. It has been impossible to move them on account of the weather situation. At Brownsville, and West Brownsville, Pa., there is an acute congestion of loaded cars which are being held up owing to the inability of the connecting line to make deliveries. The Pennsylvania lines east are not taking any coke shipments. Under these conditions little progress has been made in carrying out the plan to pool shipments. The H. C. Frick Coke Co. now is co-operating with the independents in exchanging coke in order that shipments may originate nearest the consuming point, but the expected beneficial effects of this plan must wait upon more settled weather conditions. So far as known, producers in the Connellsville region have not made contracts for last half shipment since government regulation became operative, Sept. 24, 1917. Coke production for the week ending Jan. 26 was 221,735 tons, as compared with 238,425 tons for the preceding week, according to *The Connellsville Courier.*

Sell Byproduct Coke

New York, Feb. 4.—Large sales of byproduct coke for delivery over the remainder of 1918 and also over the year beginning July 1 have been made recently by both the New England and New Jersey producers. The New England maker, which opened its books less than a week ago, has disposed of nearly 100,000 tons and sales by the New Jersey interest have been nearly as large. Most of the tonnage sold is for second quarter and last half, while considerable for the first half of 1919 also is called for in contracts for the year beginning July 1, 1918.

Floods Bar Shipments

Cincinnati, Feb. 4.—Just at a time when there was a promise of more favorable weather, heavy rains occurred in West Virginia and part of western Pennsylvania. Streams tributary to the Ohio river overflowed their banks, washed away railroad bridges and practically cut off shipments of coke from the Wise County and Pocahontas fields. New River was also affected, leaving only the Connellsville district to supply both furnace and foundry coke to consumers in this vicinity.

Demand Remains Urgent

St. Louis, Feb. 2.—Dealers report absolutely no change in the coke situation. The arrival of several trains early in the week helped out some, but consumers are experiencing difficulty in digging their consignments out of the terminal traffic congestion. The general demand continues urgent but offerings are virtually nil. Some of the most important eastern oven interests doing business in the St. Louis district have made arrangements with their representatives here by which they agree to take care of regular clients in 1918 to the extent of their 1917 consumption, but nothing more. In several notable instances these producers are allowing their representatives a commission out of the government price.

Production is Steady in South

Birmingham, Ala., Feb. 5.—Both coal and coke production is steady in the south and the prospects are that all needs of the furnace companies can be met promptly. There still is an acute shortage so far as coal is concerned. The agreement between operators and union miners and mine workers, as formulated by the federal fuel administrator at Washington, to prevent long-drawn-out contentions in Alabama, now is in effect, and the belief is there will be uninterrupted work on the part of the miners. Priority orders are being filled by the operators and instructions of the administrators are being carried out to the letter as far as possible. Nothing is being said about new contracts for coke beyond the assertion that government prices are being rigidly carried out. Shipments of coke from the district appear to be liberal. Byproduct coke ovens, almost to the oven, are in blast with the output good. The Birmingham Trussville Iron Co. is manufacturing coke in its own ovens, and is independent.

Scrap Market Unsettled

Transportation Conditions Still Effectually Block Trading in All Centers—New General Committee Appointed

FOR COMPLETE SCRAP PRICES SEE PAGE 404

New York, Feb. 6. (By wire.)—The new subcommittee on scrap to act with the general committee on steel and steel products of the American Iron and Steel institute has been appointed to replace the subcommittee recently resigned. The new subcommittee, of which Vernon Phillips of Philadelphia is chairman, liberally represents all branches interested in scrap. It consists of approximately 35 members. One or two acceptances still are to be received, after which the subcommittee will organize.

Chicago, Feb. 5.—Continuance of the deadlock in the scrap market, brought about by lack of shipping facilities and shortened consumption, seems to be having the effect of bringing some offerings on the market on the part of smaller dealers who must turn them into money. The effect of this has been to bring out some lower quotations on a few grades, but the general level of the market is unchanged. Consumers are not in need of material until the fuel supply is increased and production of scrap is somewhat lessened for the same reason. The weakness noted results from the necessities of some dealers to obtain money, causing them to offer material at a concession. The Missouri, Kansas & Texas offers 490 tons, the Chicago & North-Western 2500 tons, including 750 tons of long steel rails, and the Chicago, Burlington & Quincy 2220 tons.

Dealers' Trading Blocked

Boston, Feb. 4.—There is a fairly good demand for all kinds of scrap, but New England is rather far removed from the principal points of consumption and with the dealers of this section pretty thoroughly tied up as far as shipments are concerned by railroad embargoes, actual business is of pretty slim volume. No trouble is had in getting out nearby shipments but there are not many big users in and around Boston. The market maintains a firm tone. Wholesale dealers' paying prices per gross ton, f.o.b. shipping points, follow: Wrought No. 1 yard long, $30 to $31; horse shoes, $30 to $31; cotton ties, $21 to $22; stove plate, $20 to $20.50; No. 1 machinery, $33.50 to $34.50; No. 2 machinery, $28 to $29; car axles, iron, $43 to $44; steel, $43 to $44; rerolling rails, $30.50 to $31; iron boiler plate, $34 to $35; bundled barrel hoops, $17.50 to $18; wrought iron, new specifications, $27 to $28; steel rails, $26 to $27; No. 1 railroad steel, $26 to $26.50; heavy melting steel, $25.50 to $26.50; axle turnings, $21 to $22; machine shop turnings, $13 to $16; cast borings, $16 to $17; drop forge trimmings, $21 to $22; cast iron car wheels, mill price, $35 to $37.

Business at Minimum

Philadelphia, Feb. 5.—A combination of intense cold and severe railroad congestion is keeping business in old material at a minimum in this district. Many consumers are receptive purchasers of scrap if they could obtain these supplies. Consumers are obliged to draw upon stock or material nearby to meet their needs which, however, have been greatly reduced because of curtailed operations.

May Allow Breakage Extra

New York, Feb. 4.—With no improvement in transportation facilities, the iron and steel scrap trade in this district continues to labor under a heavy handicap. Despite the various measures put into effect by authorities at Washington to relieve the railroad situation, continued cold weather and additional snowfall have tended to counteract any good that might have been accomplished. Although the futility of trying to obtain shipments has kept many consumers out of the market, a good volume of inquiry still appears. During the past week prices on machine shop turnings have advanced to $17, and city wrought, short stock, to a range of $27.50 to $28. All other descriptions are unchanged. A proposal is under advisement by the Iron and Steel institute at present which would allow sellers to charge several extra dollars for breaking cast scrap. This charge would be in line with that now allowed for preparing heavy melting steel for extra use.

Pittsburgh Market is Dull

Pittsburgh, Feb. 5.—Extreme dullness prevails in the market for old material. Railroad embargoes make it extremely difficult to ship scrap to consumers and for dealers to secure supplies. Permits to make shipment can be obtained only in rare instances and this apparently has caused some consumers to withdraw from the market. A large tonnage of heavy melting steel is being sought for delivery at Brackenridge, Pa. While stocks of most dealers are reported to be either low or entirely exhausted, it is claimed that some have considerable supplies on hand which have been accumulating gradually. In the event the traffic situation improves appreciably, dealers believe that shipments to consumers can be moved freely and demand satisfied. This has led some to express the view that the market will become easier. One factor which gives rise to the belief that the market would soften if the traffic situation were relieved is that consumption has fallen off greatly due to the curtailed operations of furnaces and mills.

Weather Again Blocks

Buffalo, Feb. 5.—The scrap market which had been tied up for weeks on account of the rail situation, and which showed some prospect of loosening up, has again been throttled down by adverse weather conditions in this district. The demand continues as healthy as ever. Stocks remain low. Three railroad lists closed during the week but tonnages were light. Within the next 30 days dealers believe the plants having government orders will begin the manufacture of shells and guns and the production of consequent scrap. This should bring large tonnages of turnings and shell ends into the market. This development is being eagerly awaited by consumers. Cast scrap and malleable apparently have entirely disappeared from the market, the supposition being that these two grades, prices of which are on a par with heavy melting steel, are being mixed with and shipped as the latter classification. Consumers of this district are hopeful that the government will soon take measures to adjust the prices of all grades of scrap so far left untouched. The strong demand for heavy melting steel has pushed up the price of all grades to practically $30. It is thought that the market would steady itself if the prices on all commodities should receive government attention.

Selling Opportunities Numerous

Cleveland, Feb. 5.—Iron and steel scrap dealers in this district complain that while they are in the position of not being able to buy, the opportunities to sell are many. Almost any grade of scrap would find a ready

market just now, with heavy melting steel the prime favorite, but producers are refusing to let go of tonnages or have none. One Chicago steel castings interest that has plants in many cities of the middle west is sounding out dealers here to the extent of their heavy melting steel stocks. Opinion of last week has been borne out only partially, for while congestion has eased up some the subzero wave that arrived the first of this week is expected to offset it. Permits for cars are more easily had, but permits and empty cars are not synonymous by any means. The trade here is anxiously awaiting word from New York that the American Iron and Steel institute has reorganized its subcommittee on iron and steel scrap.

Inbound Shipments Limited

Cincinnati, Feb. 4.—Dealers still have their hands tied and are unable to make shipments to the large consuming districts. Yard stocks are not increasing, as inbound shipments are few and far between, and only come from railroads who can make delivery from their own lines. The market does not seem to be strong, but the few transactions made are generally on the government's maximum price basis less the freight rate of $2.50 per gross ton to Pittsburgh, where a large part of scrap accumulated here is shipped. The local foundries are buying sparingly.

St. Louis Frozen Up

St. Louis, Feb. 2.—Embargoes and general railroad congestion continue to seriously affect activities in the local scrap market. The entire region is frozen tight and cars in transit are hopelessly delayed. Not much relief is looked for before well into March. A canvass of leading dealers elicited the information that some demand for scrap from consumers exists, but inquiries have been conducted in a quiet manner and not openly. It is next to impossible to move a car outside of the St. Louis switching district, and about the only ones moving are those from railroads having St. Louis terminals and consigned to mills in this district.

Embargoes Felt in South

Birmingham, Ala., Feb. 5.—The railroad situation and embargoes in particular are felt keenly by the scrap iron and steel trade in the south. The market in this section is still unsettled. Changes in quotations are of a nominal character. There is considerable stock on hand and dealers are able to bring in more than they can get cars to move out.

Steel Shortage is Severe

Idleness of Finishing Mills Still Forced By Lack of Supplies —Tin Mills Ordered Supplied

Pittsburgh, Feb. 5.—Production of billets and sheet bars in this district and the valleys is not more than half of rolling capacity, owing to insufficiency of pig iron and also to a scarcity of fuel. Shipments on contracts likewise are greatly curtailed as the result of railroad embargoes. This situation has forced some finishing plants to suspend operations temporarily. Freer movement of coal shipments during the past week has had a beneficial effect for some producers, however, and it is reported that the sheet bar output may be encouraged through an order from the railroad director general to supply tin plate mills engaged in producing tonnages for containers for perishable goods. There are no offerings of sheet bars or billets, except discard tonnages of the latter and these are not heavy. A great deal of the discard tonnage is being used by producing mills for scrap and for the manufacture of such products as light rails and material for the implement trade, including plow beams and points. A broker has put out an inquiry for between 300 and 500 tons of 4 to 5-inch discard billets to be sheared to 36 inches in length, which are offered by some mills at the government price of $47.50, Pittsburgh or Youngstown, for standard rerollers. It is probable, however, discards can be obtained below this figure. Demand for wire rods continues active and comes from both domestic and foreign buyers. Some makers are out of the market, while others have taken some business recently, part of it going to the Orient. This is said to have been closed at a level considerably higher than the government price of $57 for soft rods. Shortage of steel has cut rod production greatly.

Shipments are Hampered

Pittsburgh, Feb. 5.—Accumulation of tonnages which they have rolled but have not been able to ship has caused some makers of strip steel to further curtail production. Shortage of steel also has affected output. Fair demand is being made for cold rolled strip steel but comes chiefly from the government.

Western Makers Sell

Philadelphia, Feb. 5.—Practically all the semifinished steel recently sold in this territory has been by producers in the middle west as eastern mills have no tonnage to spare. Numerous lots of forging and rerolling billets and slabs have been sold, but except in every few instances they have not exceeded 20 tons in quantity.

Offerings Snapped Up

Cleveland, Feb. 5.—Sales of odd lots of burned-end sheet bars have been made in this district at the full price of $51, Pittsburgh, or Youngstown. Sheet makers have been the purchasers. Sellers have no trouble to dispose of several times over any misfit or irregular lot of sheet bars or plates they may be able to offer. This is due to the severe shortage of rerolling material of ordinary character.

Steel Makers Exempt on Fuel Oil Licenses

Washington, Feb. 5.—Steelmakers using fuel oil are among the 11 classes of consumers which are exempted from fuelless Mondays regardless of what may develop in the future as to continuing the coalless days. This was set forth in the presidential proclamation issued Monday requiring oil producers and dealers to be licensed. Railroads, ships, the American and allied navies, shipyards, navy yards, arsenals and food manufacturers lead in preference as consumers. This action of requiring the licensing of oil distributors was taken to help railroad traffic congestion, rather than to conserve such fuel of which plenty abounds, according to Fuel Administrator Garfield.

Trumbull's Gross Triples

Stockholders of the Trumbull Steel Co., Youngstown, at their annual meeting last week were advised that gross business for 1917 was $26,240,000, as compared with $9,200,000 for 1916. After paying dividends, and allowing for estimated income and excess profit taxes, depreciation, upkeep, etc., the earnings available for common stock, were at the rate of $83 per share. Approximately $2,000,000 was the company's surplus at the beginning of 1917. In 1917, 160,000 tons of finished material were shipped, of which 60,000 tons were tin plate. Sheets and strip steel made up the balance.

Bar Repudiations Waived

Nut Bolt and Rivet Manufacturers Finally Prevailed Upon to Take High-Priced Tonnage—100,000,000 Bolts Wanted

Philadelphia, Feb. 5.—Makers of steel bars report that in nearly all cases consumers have been prevailed upon to accept the high-speed tonnages which they recently repudiated. These repudiations came mainly from nut, bolt and rivet makers who set up the claim that all producers in their line were selling at the government prices fixed on their product and even were applying the latter level to old contracts which had been booked last summer on a higher basis. Consequently they objected to the taking out of tonnage on a basis exceeding the government-fixed maximum of 2.90c, Pittsburgh and Chicago.

Bolt Inquiries Tremendous

Cleveland, Feb. 5.—Local producers are expecting to receive allotments when inquiries for nuts and bolts of tremendous size for the navy department now in the market are distributed. These inquiries call for approximately 100,000,000 bolts. One of them for 55,000,000 bolts will represent approximately 10,000 tons and the other a smaller amount. It is understood these bolts are wanted for regular stock purposes for the various navy yards. Some of the steel bar makers who were disposed recently to sell for forward delivery now are less willing to enter into contracts. Demoralization of production by recent storm and transportation troubles apparently is a factor in this changing attitude. Some of the implement manufacturers are buying freely by specifications. Several lots of bars for war purposes remain in the market. Makers have put out a new spike card which conforms to government prices.

Specifications Come In

Pittsburgh, Feb. 5.—Requirements of domestic consumers for steel bar tonnages probably cannot be met fully and promptly, owing to the sharp restriction in the output, which is about 50 per cent of capacity, due to a shortage of coal and steel. Implement makers will be supplied, however, and specifications for early shipments are being sent in by them freely. Domestic demand generally is fair and producers are well booked for the first quarter. The demand for iron bars also is active, but makers are committed for the first quarter and are not seeking new business for that period. Makers of iron bars, being engaged on extremely important government work, were exempted from the Garfield shutdown order. Demand for reinforcing concrete bars is only moderate and by reason of the restricted building operations does not promise to become active in the near future. Warehouses are selling limited tonnages, but stocks are low because of difficulty in getting mill shipments. Trouble also is experienced by warehouses in making deliveries due to the present railroad situation.

Western Market Quiet

Chicago, Feb. 5.—Reduced operation of consuming plants as well as of steel mills has caused buyers of steel bars to remain quiet for the present and demand is not strong. Contracts are being booked for moderate tonnages for delivery at mill convenience by the leading interest, regular customers being cared for in this way, but there is no heavy buying. Government demand remains heavy and tonnages are being distributed constantly for this use. Full specification of 1917 contracts has been the rule and no cancellation of any importance has been done. Specifications on material are being received steadily and users seem inclined to take all the steel they can obtain under their contracts. Wagon builders are inquiring somewhat more freely for bar iron for wagon tires for second quarter and later delivery, probably for use on government vehicles. Other bar iron business is in small tonnages and for immediate delivery. Comparatively little tonnage has been booked for second quarter. Hard steel bars are not in demand and mills are working on reduced schedule, with comparatively little business in prospect.

Reinforcing Demand Better

Buffalo, Feb. 5.—Reinforcing bars have experienced a better demand and a better placement in this district during the past week. The inquiry is mostly for lots between 150 and 200 tons.

Government Buying Shafting

Pittsburgh, Feb. 5.—The principal demand for cold rolled shafting comes from the government. Domestic buying is extremely limited. Production of shafting has been cut sharply on account of shortage of steel and fuel.

Do Not Ask Contract Modification

Pittsburgh, Feb. 5.—Makers in this district of nuts, bolts and rivets are accepting tonnages of steel bars on contracts without seeking to have prices revised downward to the government level of 2.90c, Pittsburgh. Considerable trouble is being encountered in obtaining bar tonnages on account of railroad embargoes and it is almost impossible to ship finished product for a similar reason. Unless relief is forthcoming quickly, some makers say they will be compelled to suspend operations. Although the bulk of the business being taken by makers is for the government, there is some domestic buying at current prices for first quarter. Makers report they are not taking any business at prices which are subject to revision. The navy department last week opened bids for 3000 tons of rivets and it is reported this business will be distributed among various producers.

Hoop Steel in Demand

Pittsburgh, Feb. 5.—Fairly brisk demand continues to be made for hoops, which are being sold for first quarter shipment at the government price of 3.50c. Some producers are not selling bands, feeling that the steel bar price of 2.90c, Pittsburgh, applicable to band tonnage, is too low. Operations of hoop and bandmakers are at the rate of about half of capacity.

Manganese Ore

Stiffens After Sale—Brazilian Situation Unchanged—Alloys Firm

New York, Feb. 4.—About 1500 tons of Brazilian manganese ore, expected to arrive in this country in two to three months, has been sold at $1.30 per unit, delivered at tidewater. This price compares with $1.35 and $1.40 obtained for similar ore about two weeks ago. It is believed that the $1.30 price could not be duplicated. Some 1500 tons of Brazilian ore for delivery in two to three months now is being offered at $1.35 per unit. The embargo which the Central Railroad of Brazil recently announced against further shipments of manganese ore from the state of Minas to the seaboard, is understood still to be effective.

English Ferromanganese Offered

New York, Feb. 4.—Although one or two additional fair sized tonnages of English ferromanganese for first half delivery have been offered during the past 10 days, no sales resulted. The

buyers preferred to place their orders with domestic makers, in view of the difficult shipping situation. The offers of English metal were somewhat under $250, delivered, which appears to be the firm minimum on domestic metal.

The Andrews Steel Co., Newport, Ky., has not yet closed for 1000 tons of 50 per cent ferrosilicon for the remainder of the year. Other current inquiries for this metal mostly are for carload lots. The market continues to be quoted at $170 to $175, delivered, for contract shipment and at $175 to $180, delivered, for spot.

Current inquiries for spiegeleisen call for about 25,000 tons. This includes some 1500 tons which the Whitaker-Glessner Co. recently inquired for. The market on this metal is unchanged at $60 furnace for spot shipment and around $57.50 to $58 for contracts.

Although spot ferrochrome has been sold at 48 and 48½ cents in carload lots, these prices were exceptional and no longer appear obtainable. Holders who had been asking as high as 50 cents now will do 45 cents or lower, while on metal of which the analysis is below standard, 35 cents or lower can be done. The market on spot 60 to 70 per cent ferrochrome containing 4 to 6 per cent carbon, is quoted at 40 to 45 cents per pound, furnace, and contract ferrochrome of the same analysis at $31 to 34 cents.

Ferrotungsten is slightly stronger, due in part to the higher prices on tungsten concentrates. Seventy per cent ferrotungsten now may be quoted at $2.25 to $2.30 per pound, furnace, both for spot and contract, while 80 per cent is bringing $2.35 to $2.40.

Market Becomes Firmer

Pittsburgh, Feb. 5.—With the market for 80 per cent ferromanganese recovering from a recent softness, when it was quotable at $240, delivered, it is now firm at $250 and small lots have been sold in this district during the past week at the latter level. A consumer in Ohio has taken 1000 tons of 20 per cent spiegeleisen from a producer in this district at $60, furnace, for February-May delivery. There is some inquiry for 50 per cent ferrosilicon, which is quoted at $175 to $180, delivered, for prompt shipment and at $170 to $175 for contract.

Western Ferromanganese Strong

Chicago, Feb. 5.—Ferromanganese is scarce and strong at $2.50, furnace, with many indications that the price may go higher shortly. The ore situation is increasingly difficult, both as to foreign and domestic sources, and demand for this alloy is heavy.

Plate Output is Cut Down

Eastern Mills Running Only About 50 Per Cent of Capacity—Allot Boiler Material For Lake Vessels

Philadelphia, Feb. 5.—The Emergency Fleet corporation continues to place plate orders with eastern makers, some of which run to round tonnages. Many inquiries for plates are current from private consumers mostly for immediate specifications but the mills generally are forced to turn these away as their output will not permit them to accommodate these requests. Production of most of the eastern plate mills has been cut to less than 50 per cent by the coal shortage. Several of the mills now are shut down temporarily because of the unfavorable operating conditions. The steel industry generally is operating much below capacity in the east and the present intense cold spell appears to foreshadow even worse conditions. The Lukens Steel Co. is operating at less than 50 per cent of output and other eastern plants are in a corresponding position. Activities of the Bethlehem Steel Co. are about 65 per cent mill and ingot output. Shipyards are greatly handicapped by inability of workmen to stand the severe weather.

Car Builders Get Supplies

Pittsburgh, Feb. 5.—Car builders say that they have sufficient supplies of plates on hand and are having no difficulty in obtaining shipments when they are needed. The recent selling of accumulated supplies of plates by some mills appears to have come to an end. Production has been curtailed on account of lack of fuel and the transportation situation, and few offerings are being made to domestic consumers. The government continues to place large contracts and it has been reported the Emergency Fleet corporation is about ready to take approximately 420,000 to 500,000 tons.

Distribute Boiler Material

Cleveland, Feb. 5.—Further distribution of several thousand tons of boiler steel for vessels being built by lake yards for the Emergency Fleet corporation has been made to two makers. This tonnage is not for new contracts but represents unfilled requirements arising from vessel awards made some weeks ago. Practically nothing but war work is receiving the attention of producers. Local mills virtually are out of the market. Orders for about 350 tons for 40 or 50 portable boilers for the quartermaster general's department in France have been placed in this territory.

West Gets Ship Plates

Chicago, Feb. 5.—With the government the largest customer for plates and other ship material, the steel market in the west is taking on large tonnages, mostly for shipbuilders doing their own fabricating. There also is considerable tonnage current for shipment to fabricators making it up for the Emergency Fleet corporation. This tonnage is allotted by the American Iron and Steel institute for various shipbuilders and is specified out as needed by the latter. Commitments of this sort have been heavy the past few days and under present operating conditions its delivery is uncertain under the best conditions that can be hoped for in the near future. Other users of plates have little possibility of placing contracts or of receiving material of this class.

Wire Costs

Increased Greatly by Interruption of Operations—Demand Active

Pittsburgh, Feb. 5.—Demand for wire and wire nails is active, particularly for the latter. Mills are suffering greatly on account of the shortage of coal and steel and the railroad situation and some have been compelled to shut down altogether, while others are operating on a low schedule. Some have been forced to decline good-sized orders for wire and nails for prompt business on account of railroad embargoes or through having no tonnages on hand. Production costs of wire mills are understood to have increased considerably of late because of restricted operations and the relatively higher overhead charges resulting. This condition is said to have made it barely possible for fully integrated plants even to derive a profit at government levels. Wire mills are one of the few units in the iron and steel industry that are not engaged heavily on government work. Contracts taken by wire mills for second quarter business are made subject to revision April 1.

The Ludlum Electric Furnace Corp. has taken a contract from McCord & Co., Chicago, to install a 10-ton electric furnace.

Navy Develops Lower Steel Prices

Taking of Competitive Bids on Various Products on Which Maximum Prices Had Been Recommended, May Be Significant Test Leading to Important Changes in Present System of Market Regulation

WASHINGTON, Feb. 5.—The entire price-control fabric under which the iron and steel industry is operating today may be modified considerably as the result of a test now being completed by the navy department. Quotations received by the bureau of supplies and accounts in bids opened Jan. 25 demonstrate that some grades of steel can be bought at prices lower than those recommended to the industry. As a result of the navy's action in securing some competitive bids it is felt that the whole war industries board-munitions director muddle, partially cleared by the appointment of Edward R. Stettinius as surveyor general of army purchases, may be definitely settled.

Secretary Daniels and Rear Admiral Samuel McGowan, chief of the bureau, now are considering the results of this competitive bidding test. The bids were obtained on products the prices of which had been recommended to the trade by representatives of the industry itself. The bids will be compared with the prices fixed by the industry. As a result, the navy's policy may be extended to prices established by the President, and, thereby, bring about the upsetting of the system under which those prices are being enforced.

Fixed Prices Underbid

The test was made on requirements of several navy yards for rivets, alloy steel bars, semifinished rounds, heat-treated rounds, special carbon billets and wrought iron bars and a comparison of the quotations offered with the maximum prices recommended in these lines showed that many of the materials could be had at lower figures. On rivets, quotations as much as $30 a ton under the recommended price were made, while bids on other products came closer to the recommended figures and some even exceeded the maximum now in force.

The object of the navy in returning to competitive bids is to force the war industries board to accept all prices recommended and to obtain the President's approval of them or to limit itself to allocating orders of steel on which the chief executive actually has fixed the prices. Naval officers say they are not satisfied that the recommended prices are the best that can be obtained, but declare they will abide by them if the war industries board will say they are fair and just. The navy cannot understand why the board has refused to go into the matter of recommended prices.

This brings up again the point that the navy is going to do all it can to live up to the laws which say how and how not purchases shall be made. Secretaries Daniels and Baker have agreed to pay the prices fixed by the President, even though they are only maximum. What the army will do on products on which the President has not fixed prices likely will become known as soon as Mr. Stettinius gets into action.

Some of the prices fixed by the President were approved by the steel men before his action, while others were set by him. On the recommended prices no government sanction has been officially placed. It is argued by naval men that if their test shows conclusively that competitive bidding will bring lower prices on certain recommended quotations, similar results may be obtained if the same policy is followed with the fixed-price materials. In the event competitive bidding becomes general, then the fixed prices will serve only as limits by which purchasing officers will reject or accept bids.

How successful competitive bidding may become under fixed prices depends altogether on how mill capacities are being utilized and to what extent idle equipment may be employed. It created some surprise when the navy's bids were opened and the number of bidders was disclosed. There was an average of about three companies to each class under each schedule. Among the bidders were the Carpenter Steel Co., the Crucible Steel Co. of America, the United Alloy Steel Corp., the Bethlehem Steel Corp., the Apex Steel Corp., the Camden Forge Co., the Mesta Machine Co., the Sizer Forge Co., the Midvale Steel & Ordnance Co., and the Pollack Steel Co.

It is a fact, however, that bids were sought on products for which no emergency demand exists. This may explain the number of producers who submitted tenders.

As to the successor of the war industries board which everywhere seems to be admitted slated for the discard, the President again has declared against a director of munitions. It is said he has a new plan to offer in the reorganization of the board which will come with the announcement of the selection of the successor of Daniel Willard, former chairman. What this plan is, is a matter of conjecture. It is stated that if he reorganizes it to give one or more men, but fewer than in the board now, the responsibility for its entire ramifications and ask congress to give the reorganized institution some legal powers, he will, in a measure, meet the demand for a munitions director. It is said Mr. Stettinius is to have more power after the President has acted. Whatever the President may do, it is altogether likely he will keep the various government purchasing departments intact. After all, it is urged, as far as steel is concerned, the government departments' requirements are so varied that present individual systems will not be affected.

Admiral McGowan Praises Replogle

Any impression which may have arisen in decision of Admiral McGowan to make certain steel purchases under the competitive bidding plan, that he had a personal break with J. Leonard Replogle, director of steel supply is erroneous. Only the best of friendly relations exist between the admiral and the director, friends of both declare. When he was before the senate military affairs committee, Admiral McGowan, in reply to Senator McKellar, said:

"The prices on steel, for example, have been fixed by the raw products committee. Only yesterday I went in person with J. L. Replogle, of the steel committee, one of the best men I ever knew in my life, to the secretary of the navy, and we made a joint oral recommendation to Secretary Daniels with respect to a matter of about $7,000,000 worth of steel. The facts were so plain and Mr. Replogle made them so plain that it was my pleasure to go with him yesterday afternoon. In about five minutes the secretary of the navy saw it as I did and the matter was settled. Mr. Replogle found the facts, I saw them, and the secretary approved them. It was in the form of differentials on certain shapes, sizes and grades of steel."

January Loss in Pig Iron Heavy

Restrictive Operating Conditions Cause Reduction of 489,297 Tons in Total Output Which is Lowest Since June, 1915—Daily Average Shows Decided Slump—Outlook Not Encouraging

THE tonnage of pig iron produced by coke and anthracite blast furnaces during the first month of 1918 showed a decided slump, the total of 2,396,083 tons being the smallest recorded since June, 1915. The same factors which caused the December production to fall far behind the pace set in 1916 and 1917, were evident during the past month, and many blast furnaces were forced to bank or sharply curtail production due to lack of fuel and extreme weather conditions. The January figure of 2,396,083 tons shows a loss of 489,297 tons, compared with the December total of 2,885,380 tons.

AVERAGE DAILY PRODUCTION

	1918	1917	1916	1915	1914
Jan.	77,293	101,930	102,319	51,323	60,624
Feb.	.....	94,641	106,157	59,521	67,450
Mar.	.....	105,026	107,343	66,009	75,534
Apr.	.....	110,936	107,517	70,484	75,383
May	.....	110,119	108,535	72,747	67,646
June	.....	108,675	107,127	78,998	63,486
July	.....	107,659	103,907	82,687	63,075
Aug.	.....	104,483	103,156	89,510	64,403
Sept.	.....	104,691	106,935	94,478	62,757
Oct.	.....	106,332	113,167	100,656	57,007
Nov.	.....	106,620	110,593	101,174	50,042
Dec.	.....	93,077	102,715	103,278	48,236
Av'ge	77,293	104,562	106,610	81,022	62,934

Both January and December being 31-day months, a comparison of the tonnage produced daily during these two months gives an accurate line on the tremendous loss in production. The daily average production for January amounted to 77,293 tons, a loss of 15,784 tons compared with the December daily average of 93,077 tons. In January a year ago the daily average was 101,930 tons, or 24,637 tons greater than that for last month.

Both steelmaking and merchant stacks suffered alike in production loss. The steelmaking or nonmerchant furnaces produced a total of 1,673,034 tons of pig iron in January, compared with 2,044,136 tons in December, a loss of 371,102 tons. The merchant total amounted to 692,214 tons, 109,994 tons less than the December figure of 802,208 tons.

In daily average production, the steelmaking furnaces showed a loss of 11,971 tons, the January daily average being 53,969 tons, compared with 65,940 tons in December. The merchant furnaces produced 22,329 tons daily in January and 25,878 tons daily in December, a loss of 3549 tons.

The only gain shown during the month of January was in the production of ferro. The blast furnaces of the country produced 22,824 tons of ferro during that month, or 226 tons more than in December, when the total was 22,598. In January only 8011 tons of spiegel were made, compared with 16,438 tons in December.

Because of the many stacks which were forced to bank and blow out during the month, the number active on Jan. 31 was the smallest since Dec. 31, 1915. Only 295 furnaces were in blast on the last day of January, compared with 321 on Dec. 31, a loss of 26.

Only one of the four furnaces of the Bethlehem Steel Co., Sparrows Point, Md., was in blast on Dec. 31. Furnace A has been banked since Dec. 14 on account of the coke shortage and both the B and C stacks have been blown out for relining.

Operating conditions among eastern blast furnaces are very bad. The situation is illustrated in the case of the Bethlehem Steel Co., which is blowing but one of seven furnaces at Sparrows Point, Md., two out of seven at Lebanon, Pa., three out of five at Steelton, Pa., and five out of seven at South Bethlehem.

MONTHLY PRODUCTION

	1918	1917	1916
Jan.	2,396,083	3,159,839	3,171,878
Feb.	.....	2,649,935	3,078,548
Mar.	.....	3,255,813	3,327,630
Apr.	.....	3,328,061	3,225,496
May	.....	3,413,677	3,364,584
June	.....	3,260,234	3,213,818
Total 1st half	.....	19,067,559	19,381,954
July	.....	3,337,442	3,221,127
Aug.	.....	3,238,970	3,197,838
Sep.	.....	3,140,742	3,208,041
Oct.	.....	3,296,286	3,508,180
Nov.	.....	3,198,597	3,317,805
Dec.	.....	2,885,380	3,184,178
Total 2d half	.....	19,097,417	19,637,169
Grand total	2,396,083	38,164,976	39,019,123

The Republic Iron & Steel Co., Youngstown, O., relighted its Hannah furnace on the morning of Feb. 2. This stack has been down since Oct. 10 for repairs, which included a complete new jacket. Its No. 1 Haselton furnace is banked and the company is preparing to start its Atlantic furnace at New Castle, Pa.

Operations at the A furnace of the Toledo plant of Pickands, Mather & Co., Cleveland, were suspended from Jan. 25 to Jan. 28, inclusive, because of a breakout.

Lorain furnace No. 5, of the National Tube Co., Pittsburgh, was idle 20 days in December, while the walls of the furnace were being cleaned. Slight repairs were also made at the Riverside, W. Va., No. 2 stack, causing a shut-down of six days.

The Birmingham-Trussville Iron Co., Birmingham, Ala., has placed in operation 120 of its new battery of 300 coke ovens which are to supply coke to its blast furnace. Coal for these ovens is being mined at the company's property at Labuco, Ala. A new 1500-ton coal washer is being installed at the mines and the electrical equipment is being put in shape as rapidly as possible. The furnace will be blown in as soon as a sufficient supply of coke for its operation is available.

JANUARY PIG IRON

States	No. of stacks.	No. in blast last day of month. Jan.	Dec.	Total tonnage made. Merchant.	Non-Merchant.	——Totals—— Jan.	Dec.
Pennsylvania	160	106	122	155,796	777,146	932,942	1,145,131
Ohio	79	53	61	144,921	397,727	542,648	589,846
Alabama	47	33	32	118,818	99,684	218,502	239,605
Virginia	21	14	15	40,576	.....	40,576	40,034
New York	27	19	21	77,892	91,465	169,357	177,099
New Jersey	6	5	5	17,823	.....	17,823	18,785
Illinois	24	17	17	39,136	91,081	130,217	227,405
Colorado	6	3	3				
Indiana	14	13	13	24,639	165,223	189,862	279,855
Maryland	4	3	1				
Wisconsin	6	4	4				
Kentucky	7	4	5				
West Virginia	4	3	3	41,717	24,986	66,703	69,835
Tennessee	17	10	10				
Washington	1	1	1				
Georgia	2	0	1				
Texas	3	0	0				
Minnesota	3	3	3	30,896	25,722	56,618	58,749
Michigan	3	3	3				
Missouri	1	1	1				
Spiegel—All states...						8,011	16,438
Ferro—All states....						22,824	22,598
Total	435	295	321	692,214	1,673,034	2,396,083	2,885,380

Will Clear Up Ore Doubts

Interpretation By Institute Committee of President's Announcement as to Future Contracts Expected After Conference with Lake Operators

New York, Feb. 5.—An interpretation soon to be announced by the committee on steel and steel products of the American Iron and Steel institute of President Wilson's declaration as to iron and steel contracts extending beyond March 31 is expected to clear up the uncertainties over the usual twelve-month contracts which have been disturbing the iron ore trade.

This development will be the outcome of a meeting in this city last week with members of the institute committee, by leading owners and representatives of lake ore properties. At this conference the situation was reviewed in all its aspects and the need of some official or formal guidance in this matter was emphasized. A heavy tonnage of ore has been arranged for by various consumers for the coming season, but the operators have been in doubt as to the effect of the President's restriction on contracts if these were converted into the usual full year commitments. The President's announcement provided that no iron and steel contracts should be concluded for delivery after March 31 which were not made subject to any revision of prices put in effect by accredited governmental agency subsequent to that date.

It is realized that in the case of ore definite contracts as to price and tonnage are essential in order that the operators may map out their plans in advance for producing and shipping, the season's requirements of this mineral. This is especially true, it is pointed out by the ore men in view of the fact that their mining and transportation costs have been increased by a considerable margin; and because of the factor of exhaustion of their supplies which must enter into the consideration. Some ore interests take the position that their product is entitled to some advance having not shared in the great rise of the iron and steel market up to the time of government supervision.

It developed at the meeting that no sales of ore whatever yet had been made for the approaching season and that all tonnage booked was in the form of reservations. There had been some reports current of scattered sales. Shipments of ore from docks to furnaces in January were far below January, 1917 because of transportation troubles.

Any announcement that Chairman Gary, of the institute committee, may make in interpretation of the President's statement as to contracts is expected to have important bearing on future contracts for other iron and steel products, as well as on iron ore.

Lift Embargo

On Tin Plate Sufficiently to Clear Up Overstocked Supply

Pittsburgh, Feb. 5.—As a result of a conference held last week in Washington between tin plate manufacturers and representatives of the food administration, the railroads have placed cars for the transportation of tin plate from Ohio river mills which are threatened by floods. These include the Steubenville, O., plant of the Phillips Sheet & Tin Plate Co., the Laughlin plant of the American Sheet & Tin Plate Co. and the Wheeling plant of the Whitaker-Glessner Co., and relief has been promised to others. The danger from water to the great quantities of tin plate which have been piled to the limit of storage capacities prompted the government to take steps to ship tonnages to canners making containers for perishable foods. The Baltimore & Ohio railroad has lifted its embargo on western shipments sufficiently to permit the sending of 182 carloads from the New Castle and Farrell, Pa., plants of the American Sheet & Tin Plate Co., to the Pacific coast for the salmon and condensed milk trade. Because of the shipments, some mills which had to suspend operations have resumed in part. Others are extremely short of steel and unless they receive sheet bars soon will have to close down. The food administration at Washington has been co-operating earnestly with tin plate makers in an effort to provide can manufacturers with sufficient tonnages for use in connection with the food conservation program.

Conditions Force Resales

Youngstown, O., Feb. 6.—Large tonnages of tin plate which were boxed by the leading valley producer for eastern consumers and could not be shipped on account of the existing embargoes, have been resold to a large Chicago packing house for meat containers. Other tonnages intended for eastern shipment have been diverted to the Pacific coast for export. Producers state they are able to buy enough pig tin to supply their needs and that the navy's commandeering of this metal in New York recently has not affected them to any noticeable extent.

Sheet Shipments Blocked

Obstructed Traffic Conditions Still Keep Production Low—12,000 Tons Wanted For France—More Second Quarter Inquiry

Youngstown, O., Feb. 6.—Few sheet mills in the valley are operating more than at 75 per cent of capacity on account of their inability to ship finished material to eastern points. Some mills have even been forced to cut their production to 50 per cent. Western shipments are being moved rather freely. On the other hand, many tonnages that were rolled for eastern consumers are being diverted westward. The mills are heavily booked with government business, but are unable to roll any of this on account of eastbound embargoes. The Baltimore & Ohio railroad lifted its embargoes on shipments east last week but were forced to clamp them on again after two days' tryout because of the enormous increase in traffic. The Pennsylvania railroad has annulled its embargoes between Pittsburgh and Cleveland and shipments are now being made between these points. Inquiry for all grades of sheets is heavy, although little business is being taken by the mills. Some time ago an inquiry came out from the government for 12,000 tons of galvanized sheets which were to be used for camp buildings in France but up to the present time none of this has been placed with valley mills. Practically no export business is being done. This is not because of lack of inquiry, but because so much time is required in obtaining export licenses. Traffic conditions are also a drawback to foreign business. One valley mill had a carload of sheets billed to a Canadian firm and on account of embargoes was forced to unload to save demurrage changes. The embargoes were annulled and restored repeatedly, during which time the sheets were reloaded and unloaded several

times. Finally, after the fourth loading, they were dispatched.

Inquiries are Increasing

Pittsburgh, Feb. 5.—Inquiries by domestic consumers for galvanized sheets for second quarter delivery are increasing. The leading interest has made no commitments for second quarter and so far as known none of the independents has. There is some anxiety shown by buyers as to when producers will begin to book the somewhat limited tonnage of galvanized sheets which will be available after the first quarter. While there is some inquiry for blue annealed and black sheets government buying is so heavy and promises to continue to be so, that it overshadows the domestic market.

Line Tonnages

Of Pipe Wanted by Oil and Gas Interests—Army Inquiries

Pittsburgh, Feb. 5.—Oil and gas producers are actively seeking tonnages of lap weld iron and steel pipe and jobbers are showing more interest in the market. Some makers are not soliciting this business, being committed far ahead. Another element restraining greater offerings is the fact that some mills have had to curtail their output considerably on account of fuel and steel shortage. One tentative inquiry calls for 200 miles of 8-inch lap weld steel pipe, involving approximately 10,000 tons, for delivery to a northwest Canadian province. There is also an inquiry for about 6000 tons of 6-inch pipe for shipment to Oklahoma.

Army Wants Tonnage

New York, Feb. 4.—An inquiry for 1000 tons of cast iron pipe for the ordnance department is the only single business of consequence now before eastern makers. This lot, involving 8, 10 and 14-inch pipe, is for use in the ammunition plant under construction at Keesport, N. J. Bids on a similar-sized tonnage have been received by the City of Buffalo, but no allotment as yet has been made.

Cast Pipe Tonnage Larger

Chicago, Feb. 5.—Cities are beginning to enter the market for cast pipe to care for their extensions in 1918, though not to the usual extent. High prices and difficulty in obtaining labor for laying pipe impose obstacles to buying in normal volume. Minneapolis will open bids Feb. 8 on 1300 tons, St. Paul will take bids at once on 450 tons, and Toledo opens bids today on 500 tons.

Many Airplane Sheds Let

Government Distributes 87,500 Tons of Fabricated Material For 2500 Buildings in France—Stocks Being Replenished

New York, Feb. 5.—One of the largest tonnages of structural steel yet awarded approximating 87,500 tons, has been placed by the government, with various companies. This steel is for 2500 airplane shelters, each requiring about 35 tons, for use of the American expeditionary forces in France. Of this business, the McClintic-Marshall Co. received 500 shelters, or about 17,500 tons, and it is understood that the Belmont Iron Works was awarded a similar contract. The Blaw Steel Construction Co. and others are reported to have figured in the remainder. It is stated that still more of this business will come up shortly. The greater part, if not all of 3400 tons, has been placed by the ordnance department during the past few days for eight buildings in France, each requiring 425 tons. Plain structural shapes are in better demand in this district by fabricators, warehouses and other private buyers who desire to replenish their stocks for work which is expected to come up early in the spring. One leading eastern shape mill reports that it has booked something like 10,000 tons in this district during the past several weeks, practically all for delivery over the next two to four months. Of this total, some 1500 to 2000 tons are for export to allied countries. Single tonnages included in private domestic business, in no case are as large as usual. Several small projects have been revived in the district but no anxiety is shown to close them.

Domestic Market Extremely Quiet

Pittsburgh, Feb. 5.—Fabricators report that domestic business is extremely dull. There are virtually no inquiries from private buyers and operations are devoted principally to government work. Requirements aggregating heavy tonnages were placed during the past week with structural mills by different branches of the government. Plants of fabricators which are engaged on pressing war work, either directly or indirectly, have been exempted under the Garfield shutdown order. Structural material for such undertakings as by-product coke ovens has been extempted.

Big Tonnage Sought

Cleveland, Feb. 5.—Large requirements of fabricated material for government work have been receiving the attention of shops in this district. One of these matters which recently has been up for action involved 25,000 tons. Some buyers have been showing more interest in arranging for future supplies of shapes. A local jobber has been in the market for 1000 tons and a northwestern Ohio bridge shop for an equal amount.

Building Slack in West

Chicago, Feb. 5.—Occasional indications of building needs crop out but, as a rule, the west is postponing its construction program until conditions are better suited to activity. Shipbuilding needs are taking large tonnages to be fabricated for the Emergency Fleet corporation and this is keeping some shops busy where otherwise they would have little on their books. The steel for the new Butler Bros. warehouse in Chicago still is pending, about 9000 tons, although the general contract has been let. The Western Electric Co. has asked bids on about 3000 tons for three additions at Hawthorne, Chicago.

CONTRACTS AWARDED

Building for Morse Dry Dock & Repair Co., Brooklyn, 200 tons to American Bridge Company.

Airplane factory for the Glenn L. Martin Aeroplane Co., Cleveland, 300 tons to the Ferguson Steel & Iron Co. Crowell-Lundorff-Little Co., Cleveland, has general contract.

Addition to power plant of the Pennsylvania General Electric Co., Erie, Pa., 900 tons to the Ferguson Steel & Iron Co.

Primary crushing plant, Utah Copper Co., Arthur, Utah, 197 tons, to Kansas City Structural Steel Co.

Airplane shelters numbering 2500 in France, 87,500 tons divided by the government among the McClintic-Marshall Co., Belmont Iron Works, Blaw Steel Construction Co. and other shops.

Eight buildings in France for ordnance department, 3400 tons, placed with the Heddon Construction Co. and Belmont Iron Works.

Building for National Lead Co., Brooklyn, 700 tons, to Passaic Rolling Mill Co.

CONTRACTS PENDING

Three additional buildings, Western Electric Co., Chicago, Ill., 3000 tons.

Operation of the plant formerly run by the Marinette Iron Works, Marinette, Wis., has been resumed by the Northern Foundry Co., castings for tractors and other farm machinery for the J. I. Case Threshing Machine Co., Racine, Wis., are being made and this order will take the plant's output for an extended period.

Small Portion

Of Government Car Order Closed—Private Inquiries Numerous

New York, Feb. 4.—Of the 4500 cars of miscellaneous types recently inquired for by the government for shipment to France, 400 flat cars have been placed with the Gregg Car Co. This leaves more than 2000 box cars, 1750 gondolas and a number of tank cars yet to be acted upon. Among new car inquiries are 50 hoppers for the Copper Range railroad and 50 special cars for the Phelps Dodge Co. G. C. Peterson & Co., Chicago, are inquiring for 10 to 25 tank cars. The Midcontinent Tank Car Co., Coffeyville, Kans., wants 12 tank cars. The inquiry of the Seaboard Air Line for 1000 box cars continues before the market.

The E. I. du Pont de Nemours & Co. placed 35 flat, 14 box and 44 shell cars with the American Car & Foundry Co. The Brier Hill Iron & Steel Co. placed 40 hoppers and 10 gondolas, of 70 tons capacity, with the Pressed Steel Car Co., and 25 general service cars with the Clark Car Co. The Pressed Steel Car Co. also received 50 gondolas from the Republic Iron & Steel Co.

The American Locomotive Co. recently has received orders for 128 locomotives from various transportation companies. Included in this business are the following contracts: Chesapeake & Ohio, 25; Hocking Valley, 20; Miami Conservancy district, 13; Maine Central, 10; Missouri, Kansas & Texas, 20; and Minneapolis & St. Louis, 20.

The Norfolk & Western railroad has ordered 20 and the Chesapeake & Ohio 25 locomotives from the American Locomotive Co.

The Cumberland Valley railroad is inquiring for 3000 tons of rails. The Pennsylvania railroad has bought 1000 tons of tie plates. The Reading railroad is in the market for similar material.

Inquiries for Standard Spikes

Pittsburgh, Feb. 5.—Railroads have put out inquiries for small lots of standard spikes, the principal quantities being from 1000 to 2000 kegs. Some mills are unable to quote on this business because of the shortage of steel. Jobbers are asking for deliveries on contracts for small spikes, but embargoes have been holding up shipments. Producers are taking fair-sized tonnages of light rails at the government price of 3c a pound, mill, for sections 25 to 45 pounds. Inquiries for standard rails are limited and most makers are not quoting, as they are booked through 1918 and are not ready to quote on 1919 business. Small lots for early delivery have been sold by a nearby producer, bessemer rails commanding from $60 to $63, and open-hearth rails from $63 to $65, mill.

Small Buying of Rails

Chicago, Feb. 5.—Small additional tonnages of rails for 1918 are being taken in the west, to be filled if conditions will allow. These are supplemental to former contracts and do not produce a large total. Some inquiry continues for 1919 delivery and small bookings are being made.

Car buying is practically absent and no new inquiries have come out recently. No pending inquiries have been closed in the past week.

Business is Brisk

Boston, Feb. 4.—Local jobbers in steel and iron products have had a fairly good week, but still say there is room for improvement, especially in those things not going into war work. Where railroad embargoes do not interfere, there is a good movement to war plants, but it could be and probably will be better when the coal situation passes as a restrictive influence on the operation of industrial plants. The coal situation does not respond readily to the efforts being made by state and federal authorities and not a few plants, though exempt from observing the Monday closing down, still shut down because of the lack of fuel.

Steel Pensions Mount

Pensions paid in 1917 to 2933 retired employes of the United States Steel Corp. and its subsidiaries, from trust funds totaling $12,000,000 established seven years ago by Andrew Carnegie and the former Corporation, aggregated $712,506. This is slightly in excess of the amount paid in 1916, which was $711,130. The figure in 1915 was $659,389 and in 1914, $511,767.50. The first year it was $281,457.37. The average pension now paid is $21.10 per month over the amount in 1916 and the minimum and maximum amounts are $12 and $100 per month, respectively. With disbursements for 1917, the total sum distributed in the seven years is $3,658,047.73. The Pittsburgh district in 1917 received $371,154.71; the Cleveland district, $83,724.97; the Chicago territory, $86,036.61; New England and the Atlantic seaboard, $89,434.21; and the Pacific coast, $2072.

Ship Contract

For United States Placed in Canada—Arrange for Steel

Toronto, Jan. 31.—The Canadian Car & Foundry Co. has been awarded a contract for the construction of steel ships for the United States to the value of $10,500,000, which will be filled at its plant at Fort William, Ont. An additional building, 200 x 220 feet, will be erected together with a marine railway and slip for launching the vessels. The furnishing of the material has been arranged for with the American government. The company will begin the work of shipbuilding in May, and will increase its force by about 1000 men.

Alexander Johnston, Canadian deputy minister of marine, and Charles Duguid, naval architect of the department, have been in Washington negotiating with the priority officials to secure from the United States a supply of ship plates and angles for the construction of the first vessels to be built by the Canadian government. It is announced that their mission has been successful, but so far no details have been published.

Acting under authority conferred upon them by Sir Henry Drayton, Canadian power controller, the local hydro-electric board of Hamilton, Ont., has decided that all industries regarded as nonessential must close down for one day each week in order to conserve power. The city has been divided into six districts, in each of which the order is being enforced in succession.

Washington Office Moved

The Washington office of THE IRON TRADE REVIEW and associated publications of The Penton Publishing Co., including *Daily Iron Trade and Metal Market Report, The Foundry, The Marine Review* and *Power Boating,* has been removed from 708 Metropolitan Bank building to 40 Metzerott building, 1110 F street N. Y. This change has been necessitated through the old offices having been given over to the government for the use of the federal reserve board, at the former's request. THE IRON TRADE REVIEW maintains a permanent editorial office in Washington, having been the first trade paper to station a resident member of its regular staff in the capital city.

The Miner-Morse Corp., Erie, Pa., was recently appointed sales agent for Erie, Buffalo and vicinity of "Electrite" uranium tool steel, manufactured by the Latrobe Electric Steel Co., Latrobe, Pa.

Auto Makers Are Still Buying Tools

In Spite of 40 Per Cent Cut in Car Output, New War Activities of Plants Necessitate Purchase of More Equipment—Adaptability of Industry Minimizes Loss

WHEN the automobile industry, now the third largest branch of manufacture in the United States, suddenly found its market restricted, its supply of materials limited and its shipments given last rather than first preference, a curtailment of production resulted that made itself quickly felt in several other industries. The prodigious size of the motor car industry in the United States may be gaged by the 1917 output of 1,300,000 cars having an approximate valuation of $1,000,000,000. Makers now hopefully estimate that the production for the current year will be between 50 and 60 per cent of this total. One automobile builder contends that this curtailment will be a healthy thing for the industry in that it will restrict over-production. This latter has been one of the evils that the industry has been forced to contend with practically since the invention of the gasoline-propelled vehicle.

Irrespective of the announcement made by the bureau of mines that less motor fuel will be available for domestic use in 1918 than during the preceding year, automobile builders point to the recent increases of individual incomes in many branches of industrial work, which may in part sustain the market of pre-war days. Since well over 90 per cent of the product of the automobile industry consists of pleasure vehicles, this theory proves to be of considerable weight. The automobile industry also points to the vast government expenditures of about $1,000,000,000 monthly; the present prosperity of the farmer, together with his inclination to regard the motor vehicle as a necessity rather than a luxury, and the increased importance of the automobile in every-day business as hopeful indications of a market which may be limited but not dormant.

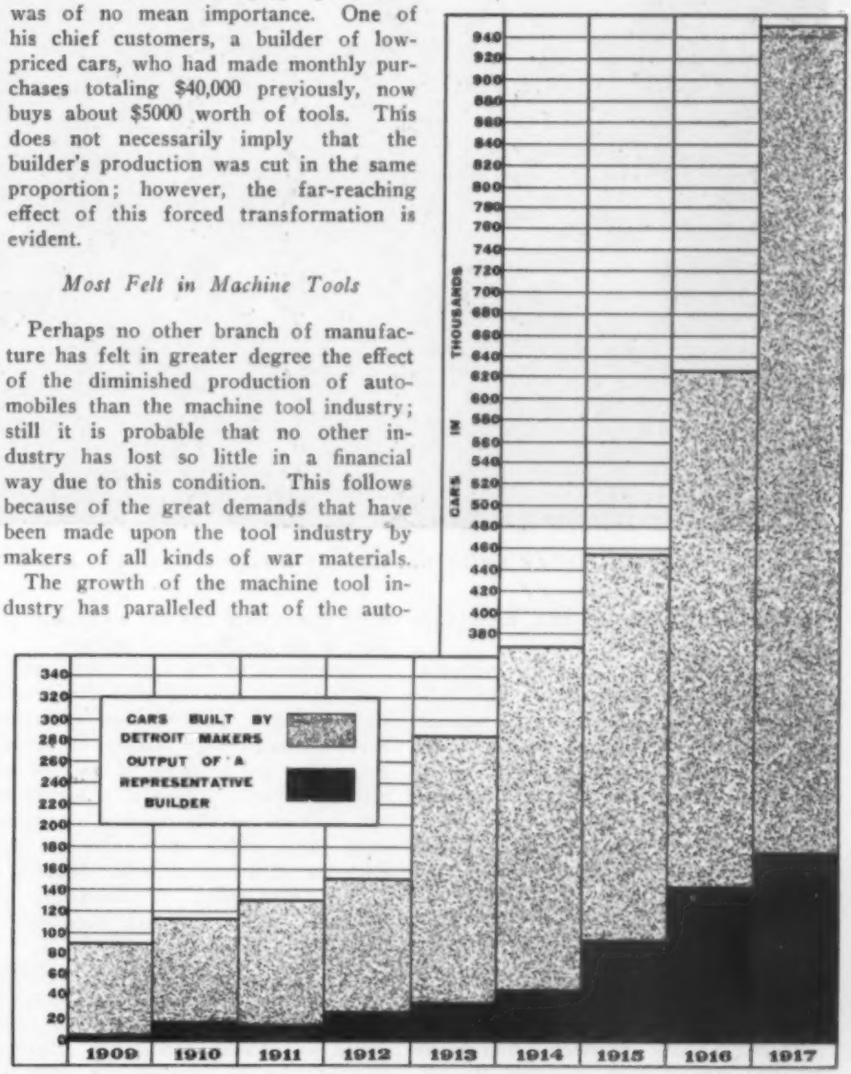
Interesting developments following the usual yearly car displays in various cities, have been observed. A decided increase in the demand for pleasure vehicles of the moderate-priced class has been manifested. Contrary to expectations, the demand for high-grade cars has been much smaller than has been looked for. An explanation in the first case is found in the higher earnings realized from war work, as compared with the pre-war standards.

Many efforts are being made to transform this highly adaptable industry into other fields of manufacturing more directly associated with work essential to the progress of the war. This diversion of the endeavors of the maker of automobiles from one line of activity to another has in nowise compensated for the losses occasioned other industries by this change. In one case a prominent maker of machine tools had been supplying many large motor car builders. Almost his entire plant was devoted to the production of tools for this special type of work. Among his customers were numbered builders of all grades of cars. When the pleasure vehicle production began to decline, he was able to pick up several lines of manufacture that he had not developed fully and to push these successfully, but his loss in changing production was of no mean importance. One of his chief customers, a builder of low-priced cars, who had made monthly purchases totaling $40,000 previously, now buys about $5000 worth of tools. This does not necessarily imply that the builder's production was cut in the same proportion; however, the far-reaching effect of this forced transformation is evident.

Most Felt in Machine Tools

Perhaps no other branch of manufacture has felt in greater degree the effect of the diminished production of automobiles than the machine tool industry; still it is probable that no other industry has lost so little in a financial way due to this condition. This follows because of the great demands that have been made upon the tool industry by makers of all kinds of war materials.

The growth of the machine tool industry has paralleled that of the automobile and has been dependent upon the latter largely for a market previous to the declaration of hostilities in Europe. After the outbreak of the European war, large numbers of tools were bought both for foreign and domestic use in connection with contracts of a military character. Upon the entrance of the United States into the world war, tools were bought in unprecedented numbers for destroyer, cargo ship and munition work. Most of these tools, however, are either single-purpose machines, or of the heavy type. A proportionately smaller number of light than heavy tools has been required for war work; consequently the production



LOCALIZED MOTOR CAR PRODUCTION RATE BY YEARS AND INCREMENTS OF 20,000 CARS

of light tools has been in excess of that which would have been expected.

The machine-tool capacity of the nation in the heavy types has been limited; furthermore the facilities for producing the lighter and some of the special designs required for automobile production, do not lend themselves readily to the manufacture of parts for heavy equipment; therefore the dropping off of automobile production exerted a temporarily depressing effect on many machine tool plants. Gradually this has been overcome due to the steady transformation of the machine tool industry in its endeavor to equalize the wide divergence between supply and demand of the heavy and light tool markets.

Due to the fact that many automobile makers are engaging in the construction of airplane motors, it was at first thought that these makers would issue inquiries for tools which would neutralize largely the shrunken demand from other makers. Numerous cancellations, however, were made by other makers not engaged in airplane motor work and these were of sufficient volume to ease the market for this type of equipment. Because many light tools may be used for airplane work and these may be obtained within reasonable delivery periods, and owing to the production capacity available, automobile builders readily have absorbed the orders released by the adoption of the government's extensive aviation program.

Automobile builders not engaged in war work are buying no equipment and many others who are doing work of that nature are purchasing only necessary additional equipment, or buying only to replace worn tools. If the production of automobiles is cut to less than 60 per cent of normal, obviously even the replacement requirements will be materially affected; but in view of the expansion now evident in other branches of industry it is thought that the shrunken demand on the one side will be more than equalized by the augmented necessities on the other. Owing to the present need for tools of all kinds, the diminished requirements from this source are not so plainly evident in the machine tool market.

Curtailment of the automobile production rate has also affected the pressed steel industry, and various authorities have estimated that makers of pressed steel parts are working at only 60 per cent of capacity. This is a logical result in view of the number of pressed steel parts which enter into the construction of an automobile. Makers of pressed steel parts of stampings and of drawn parts now are engrossed in developing other industrial fields. As a step in this direction an organization has been formed of practically all pressed steel makers and offices established in Washington. The organization has for its purposes the promotion of government work of this character, and the association of its members to meet any extreme emergencies that may arise. As a result of the smaller demand for metal stampings and similar parts, the demand for punching and shearing equipment has been diminished. In one city where the production of parts and accessories for automobiles increased 475 per cent in 10 years, the depression as affecting parts makers became serious.

Manufacturers of electrical equipment have been affected by lowered automobile production; rubber manufacturers now are concentrating on the production of motor truck tires rather than pneumatic tires; motor builders are entering upon the manufacture of airplane motors on an extensive scale; truck makers either are enlarging their capacities for the production of trucks, are developing new tractors or are going into munition work; body builders are readily branching off into the construction of airplane parts, and wheel makers are devoting their energies to the manufacture of wheels for motor trucks, and other military requirements. Restriction of the supply of alloy steel to the automobile industry insofar as the utilization of such material in pleasure vehicles is concerned, has tended to discourage the efforts of makers in this line to seek other markets for their product.

Although the domestic demand for cars may be much smaller during the next few years—depending upon the length of the conflict—export figures

MULTIPLE SPINDLE DRILL SECTION OF A PLANT EQUIPPED SOLELY FOR BUILDING MOTOR TRUCKS

show that there has been a gradual increase in shipments of pleasure vehicles to neutral countries during the past year. Exports of automobiles during the last fiscal year totaled $90,000,000. It is realized these markets, if they are not to be lost, must be fostered during the present emergency.

Because of the adaptability of a well-equipped automobile plant, little difficulty has been met with in changing from the production of pleasure cars to motor trucks, airplane engines, and tractors. No other industry requires so extensive a supply of equipment and none other, in the main, has a more complete metal-working plant incorporating. A company in the central west which had specialized on trucks and pleasure vehicles before the war, furnishes a good illustration. With the gradual slackening of the pleasure car demand, the unused space and machines were rearranged and additional machinery installed, upon the receipt of small munition orders. Several large contracts were secured later and the company thereby practically insured itself against difficulties during the war. At the present time this plant is engaged mainly in producing munitions; 75 per cent of its capacity being used for this purpose, while the remainder is devoted mostly to the building of motor trucks, and a multiplicity of parts.

PUNCH PRESS INSTALLATION TYPICAL OF THOSE THAT SUPPLY NEEDS OF THE AUTOMOBILE INDUSTRY

rated under one roof. Almost every type of machine tool finds some application in the automobile plant; many plants, in addition, have facilities for molding and stamping metal, not to mention the many other departments requiring metal-working equipment which are essential to the operation of a plant building a car practically in its entirety.

In the proportion of munitions, the automobile industry is taking a leading part. Enormous quantities of war materials are being made in automobile factories largely because of the unusual adaptability of these plants, their efficient organizations and their capacity for quantity production. Many of the plants are working to capacity; their output having been divided between automobile production and munition mak-

Under the generic term of "automotive," the automobile industry is branching out into almost every field where the internal combustion engine serves as a prime mover. The first critical period brought on by the war has been passed and makers are being urged to devote attention to every possible means of retrenchment. Builders have been asked to encourage the hauling of steel and other products by motor trucks; they have been prevailed upon to train women to take the places of men in their plants; they have been urged to avail themselves of the principle of labor dilution, and they have been acquainted with the necessity of substituting various materials, for those, which war's needs make it almost impossible to obtain. A compliance with these suggestions, it is maintained will strengthen the industry and fit it to enter the markets of the world on an efficient basis after the war.

"A Quarter Century of Progress" is the title of an attractive booklet issued by the Osborn Engineering Co., Cleveland. The booklet describes the growth of the company since its organization in 1892 and gives a partial list of buildings designed and erected by the Osborn organization. A page of interesting statistics is included which states that the company has built foundries, machine shops, rubber manufacturing plants, cement plants, base-ball parks, bridges and miscellaneous plants to the value of over $40,000,000.

That the iron and steel industry in Japan is on the increase is reported by the *Weekly Bulletin* of the Canadian department of trade and commerce. Before the war Japan's annual production of iron was 260,000, or about one-half of its consumption. Since the war commenced many new companies have been formed to produce iron, and six companies with a combined capital of 40,000,000 yen have established new works. Three new steel companies have commenced operations and four new steel works have been established. Three new companies, with a combined capital of 2,300,000 yen, have been established for the manufacture of machinery.

Modern Gun Manufacturing Plant

How a Large Ordnance Plant Was Planned and Built in 90 Days for Manufacturing 75-Millimeter United States Field Guns—All Machine Tools Are Carefully Arranged to Insure the Maximum Output

WHEN the United States entered the war, the full power of the world's greatest manufacturing industries was ready to back up our ultimatum. Despite the delays imposed by departmental inefficiency, as disclosed in recent investigations, the government has been receiving from the manufacturers, in satisfactory volume, most of the materials required.

In the manufacture of heavy ordnance, however, the war practically demanded the creation of a new industry. Up until the first rush of war orders in 1915, heavy ordnance had been turned out largely at government arsenals. During the next two years, a few private manufacturers began to make ordnance for the allies. Their output, however, is far below that required now to supply the United States as well as our allies.

Heavy Ordnance Problem

How to increase the output of heavy ordnance was one of the most troublesome problems faced by the government. The testimony of General Crozier, chief of ordnance, before the investigating committee of the senate, while revealing the serious delays resulting from red-tape methods, showed clearly the difficulties involved in building an ordnance manufacturing industry from the ground up.

Building New Plants

New plants had to be built in a few months, workmen made experts in a few weeks and jigs and fixtures designed and made. In normal times, such a program would have required years to work out. Now huge plants must be built almost overnight and an efficient organization trained in an incredibly short time.

An illustration of the speed required in constructing a large ordnance plant is furnished by the record of the Symington-Anderson Co., Rochester, N. Y. This company's contract is for a large number of 75-millimeter guns which will be completed at a satisfactory rate of speed. Provision has been made, however, to increase the capacity of the plant 50 per cent if this becomes necessary. The guns will be complete with the exception of the recoil mechanism, carriage and caisson. A building with 157,000 square feet of floor space was started late in July, 1917, and finished on Nov. 1. The layout of machine tools in this plant is also interesting as showing the arrangement approved by engineers who were able to disregard every factor except that of properly equipping a plant for maximum output.

Two thousand men will be employed, working in three 8-hour shifts. A production of a baker's dozen of guns a day by 2000 men seems like a limited output to those not familiar with ordnance construction. However, a 75-millimeter field gun, without the recoil mechanism, carriage or caisson, weighs 750 pounds. These guns are made from solid forgings and many of the operations necessary in machining them are of an extremely intricate nature. Again, all machined dimensions must be within very close limits owing to the vital importance of the finished gun functioning properly at all times.

Departments to be Added

To the present factory will be added a completely equipped rough machining department and a heat treating plant. The rough machining department will be housed in a building 360 feet long and 110 feet wide. The heat treating plant will occupy a building 200 feet long and 100 feet wide. In the heat treating plant, all furnaces for handling the forgings will be electrically

FIG. 1—INTERIOR VIEW OF AN ORDNANCE PLANT BUILT AND EQUIPPED IN 90 DAYS

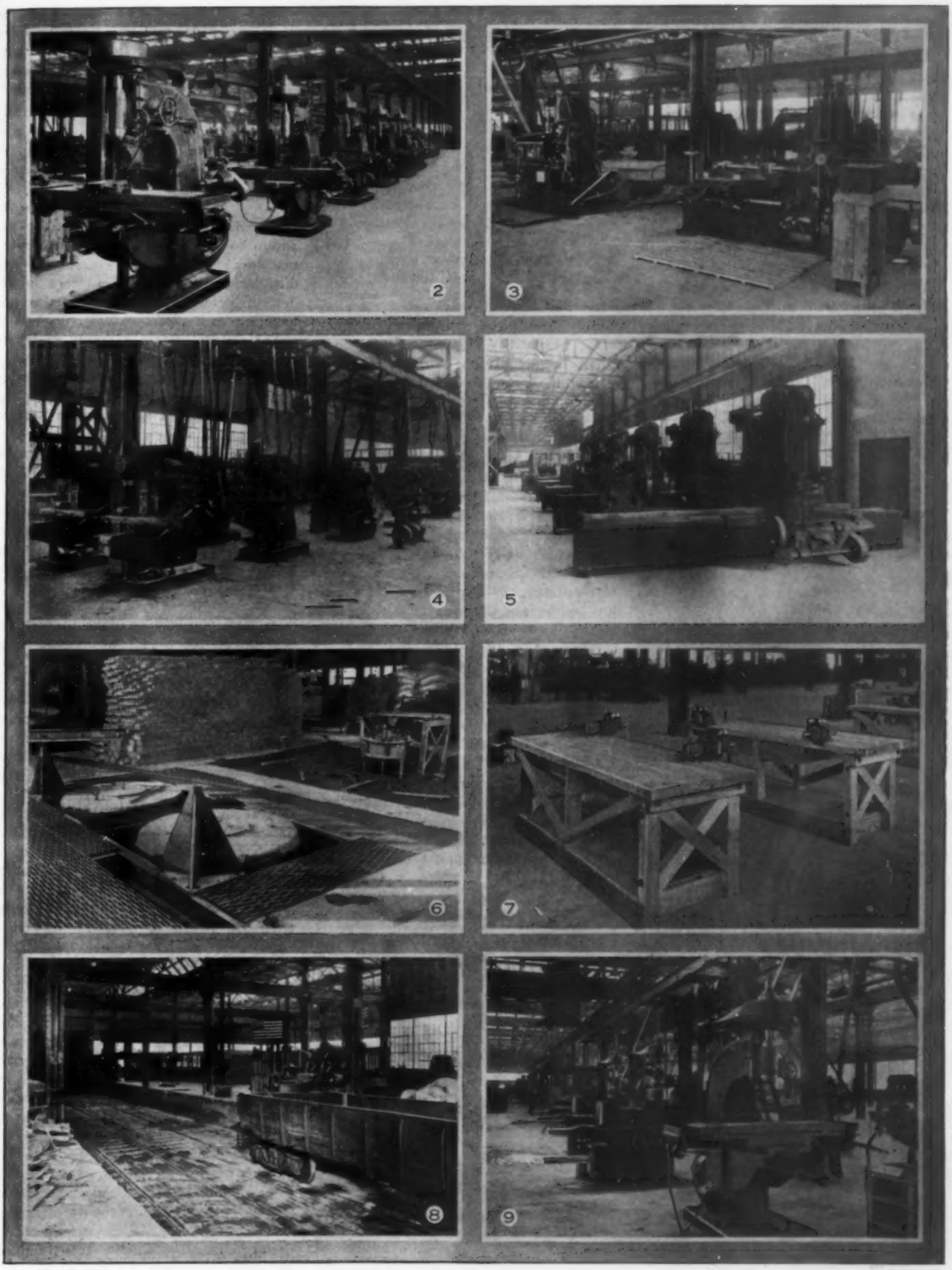


FIG. 2—A GROUP OF HIGH POWERED VERTICAL MILLERS
FIG. 3—A VERTICAL GRINDER AND A HORIZONTAL BORING MILL
FIG. 4—A GLIMPSE OF THE TOOLROOM
FIG. 5—A BATTERY OF HEAVY MILLING MACHINES
FIG. 6—THE SHRINKAGE PITS
FIG. 7—SUBSTANTIAL BENCHES FOR THE FITTERS
FIG. 8—A VIEW OF THE SHIPPING BAY
FIG. 9—A VERTICAL MILLER AND TWO GRINDERS

heated, a distinct departure from present day practice.

Immediately after the contract was closed, a subsidiary company began to design the jigs and special tools. This work was carefully organized so that the tool drafting department was able to supply the toolroom with an abundance of completed tool drawings two weeks after the initial layout was made. Work on the tools was begun during the latter part of July, 1917, and at the present time the tools are complete in every detail.

The building site as it appeared in July is illustrated in Fig. 12. Fig. 14 is a view of the building a few weeks later, while the finished structure is shown in Fig. 15. The building is substantially built; the necessity for speed not being permitted to lower the quality of the construction.

The office and finish machine shop are complete in one building, which is 700 feet long and 225 feet wide. Ample light is assured by the saw-tooth roof construction and by steel sash windows. Powerful electric lights with adequate reflectors are also provided.

The machine shop is built in six bays each 580 feet long and 37 feet wide. Each bay, with the exception of the one at the extreme west side, is commanded by two 15-ton traveling cranes. These cranes facilitate the transfer of material and the handling of heavy machine tools. Material is moved on the floor by electric trucks.

Machine Tool Layout

In the several bays the traveling cranes serve the following machine tools: First bay, 15 heavy type horizontal millers, 8 tube boring machines, 18 engine lathes, 3 cylindrical grinders and the shrinkage pits; second bay, sixteen 36-inch planers, 10 slotters, 8 vertical millers, 4 radial drills, 2 broaching machines, 10 engine lathes and 5 rifling machines; third bay, 11 slotters, 2 vertical turret lathes, 15 vertical millers, 16 engine lathes, 1 radial drill, 9 milling machines, 2 radial drills and 2 planers; fourth bay, 2 vertical turret lathes, 2 radial drills, 19 milling machines, 2 vertical grinders, 20 engine lathes, 1 heavy duty miller and 3 shapers; fifth bay, 7 milling machines; sixth bay, 42 benches, 2 shapers and 18 drilling machines.

A general plan of the machine shop is shown in Fig. 15. This building runs approximately north and south with the office at the southern end. At the northern end of the building is located the electrical repair shop, the office of the mechanical repair department, the receiving department, the storeroom and the shrinkage pits. A view of the shrinkage pits is shown in Fig. 6.

The size of the huge shop is clearly indicated in Fig. 1, which is a general view looking south. As shown in the illustration, the tools are not crowded together, an arrangement which permits the installation of more tools when increased capacity is required.

The machine tool layout was carefully worked out long before a single tool was placed in position. The tools are so arranged that the various pieces in process of machining travel in one direction through each department to the next. Before determining upon the position for each individual tool, every machining operation was carefully studied by the company's engineers in order to determine the best method of handling each piece.

The results of this intensive study are reflected in Fig. 3 which shows how a vertical grinder and a horizontal boring mill have been placed side by side. Fig. 9 shows how two high-powered surface grinders and a vertical miller have been similarly arranged. This arrangement is in striking contrast with the methods of a few years ago in which all tools of the same kind were grouped together, regardless of how the work was to be routed. In the Symington gun shop, each tool was installed with particular reference to the work required.

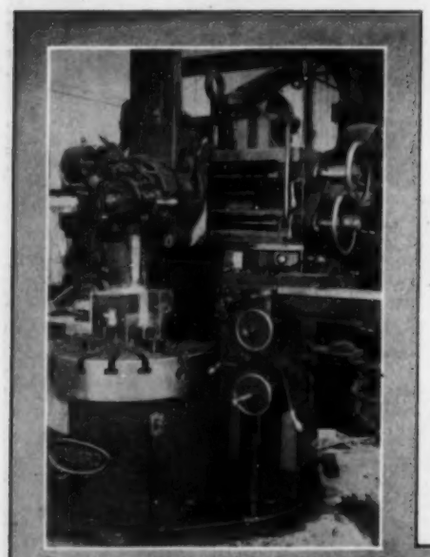
Efficiency tests have shown that certain operations can be done to best advantage on the planer while others are adapted particularly to the heavy duty type of horizontal miller. For this reason, both types of machines have been installed and their proper arrangement carefully determined. A battery of heavy milling machines is illustrated in Fig. 5. The vertical type of milling machine was also adopted for several important operations and a group of these machines is shown in Fig. 2.

While the factory will not begin operations until Feb. 1, a certain amount of experimental work is going on at the present time. Fig. 10 shows the operation of boring a breach ring on a vertical turret lathe while the milling of the under side of a jacket is shown in Fig. 11.

As an example of the thoroughness with which the work has been planned, a toolroom has been equipped for manufacturing such new tools as may be required from time to time and for repairing tools that become worn through use or are damaged by careless handling. The toolroom is located in the southwest corner of the shop. A view of the tool room is shown in Fig. 4.

Two tool cribs for the storage of small tools are conveniently arranged. As shown in Fig. 15, each tool crib is designed to serve approximately half of the shop. Through the use of two tool cribs instead of one larger crib, considerable economy is effected in the time spent by the workman in walking to and from the tool crib window.

The manufacture of ordnance calls for



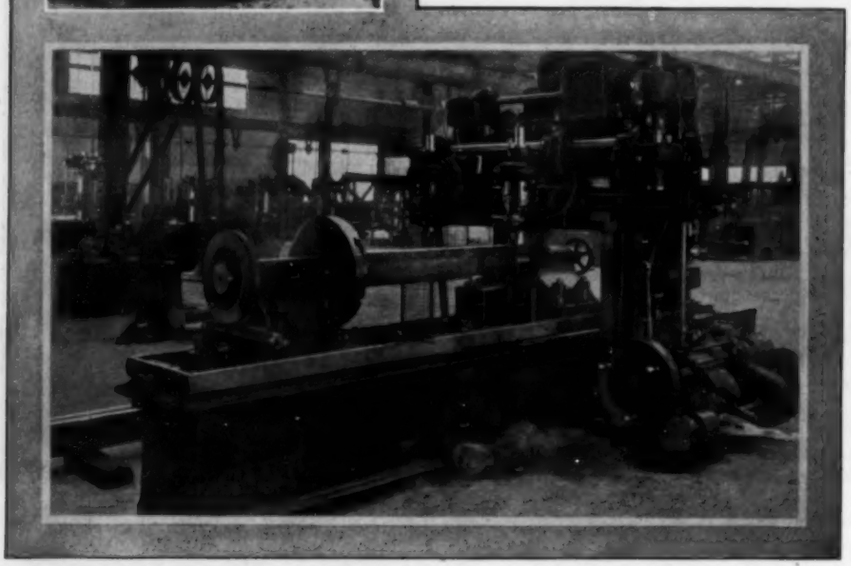


FIG. 10—BORING A BREECH RING ON A VERTICAL TURRET LATHE

FIG. 11—MILLING A GUN JACKET ON A HORIZONTAL MILLER

FIG. 12 — THE SITE BEFORE GROUND WAS BROKEN—FIG. 13—THE COMPLETED SHOP —FIG. 14—THE BUILDING PARTLY COMPLETED

a large amount of hand work such as filing, scraping and fitting. A department has been equipped with 42 vise benches of the type shown in Fig. 7. These benches are made of maple and are of rigid construction, being securely braced in every direction. A separate drawer equipped with a lock is provided for each workman.

Handling Shipments

The company has its own private railroad siding, two tracks running into the factory. These tracks are placed below the level of the shop floor, bringing the car floor level with the floor of the shop and facilitating the handling of incoming and outgoing shipments. This shipping bay is illustrated in Fig. 8. These tracks are also used to carry the rough forgings to and from the machine shop to the heat treating and rough machining departments.

The offices are well lighted, completely equipped and efficiently arranged. This factor of the business was given the same painstaking attention that was spent in planning the shop to the end that both departments could work at maximum efficiency. The office equipment includes many modern devices for expediting clerical work.

The principal parts of a United States field gun are the breech block, breech ring, jacket and tube, or barrel as the layman terms this part. These pieces are all made from machine steel forgings.

The forgings as received at the Symington factory first go to the rough-machining department where a large part of the superfluous metal is removed. They are then inspected for imperfections, such as laminations, that might not be noticed in the rough forgings. The forgings are then taken to the heat treating department, where the material is treated to meet the rigid specifications imposed by the government. The pieces are then transferred to the machine shop to be machined to proper dimensions.

The material for breech blocks goes to the west side of the shop, where milling, planing and boring operations are performed. The finished parts are then transferred to the assembling department.

Progressive Operations

The forgings for the breech rings are taken to the east side of the shop where they are turned and milled on the outside. The hole for fitting over the jacket is carefully bored on a vertical turret lathe and the aperture in which the breech block slides is machined on a slotter. A few minor operations are next completed after which these pieces are sent to the assembling department.

The material for the jackets goes first to the east side of the shop. The plane surfaces are finished on planer and millers after which the pieces travel to a group of lathes where parts of the jacket are turned and the hole for re-

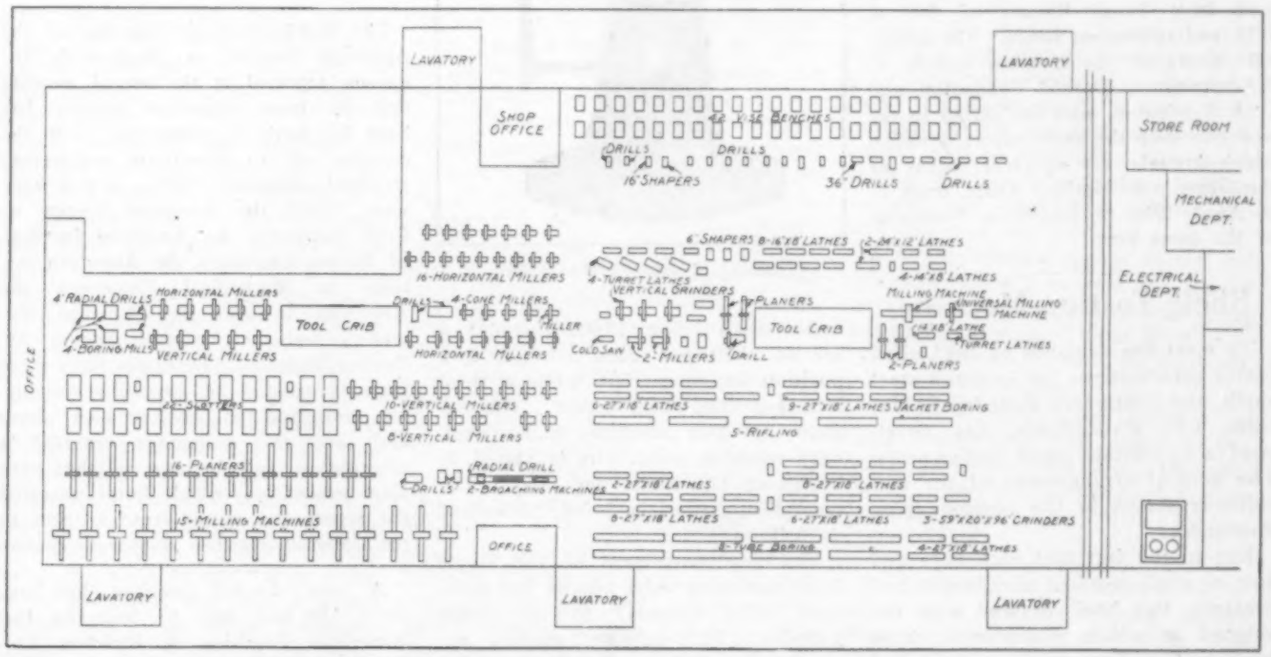


FIG. 15—ARRANGEMENT OF TOOLS IN THE NEW ROCHESTER GUN SHOP

ceiving the tube is accurately bored to the required size. The pieces are then transferred to the shrinkage pits.

The forgings for the tubes are also machined on the east side of the shop. The work consists of turning the outside and accurately boring a straight and uniformly sized hole the entire length of the piece. The outside portion which fits into the jacket is accurately ground to size on cylindrical grinding machines. The tubes are then taken to the shrinkage pits. Here the jackets are heated to a black heat, the tubes inserted and the two parts allowed to cool. As the jacket contracts, it grips the tube firmly, thus causing the two pieces to form practically an integral unit.

This unit is now returned to the machine shop where the tube is rifled. In this operation, rotary grooves are cut on the inside of the tube, the grooves imparting a rotary motion to the shell as it leaves the gun. This work is done on specially designed rifling machines. After this operation is completed, the tube and jacket are taken to the assembling department.

In this department, the breech ring is fitted to the jacket and the breech block fitted to the breech ring. The latter operation is an important one, as the breech block inserts the shell in the gun as well as ejecting it. Various minor parts, such as the breech block controling mechanism are now assembled and the gun is ready for government inspection.

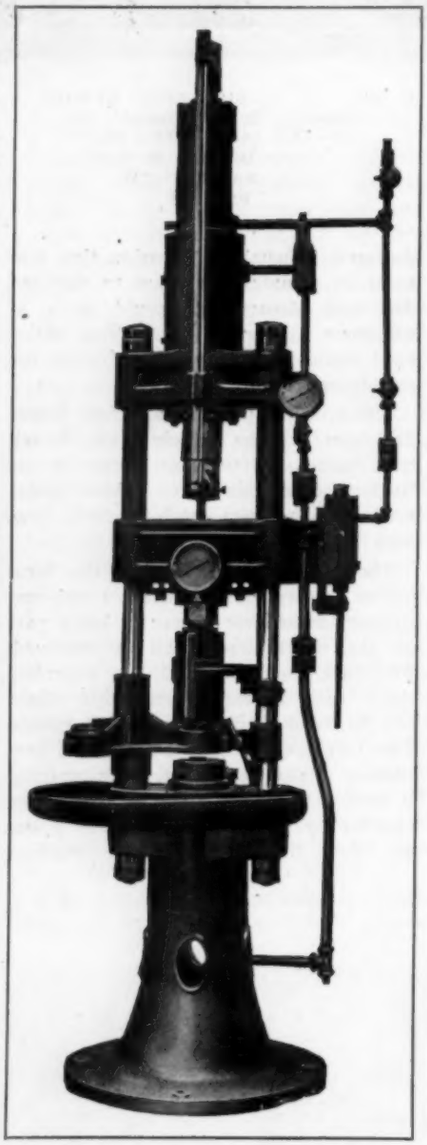
The Symington-Anderson Co. is a subsidiary company of the T. H. Symington Co., which in the latter part of 1915 organized the Symington Machine Corp. for the purpose of making shrapnel. A full account of this work was given in THE IRON TRADE REVIEW of Jan. 4, 1917, and subsequent issues. The principal officers of this company include T. H. Symington, Donald Symington and C. J. Symington, who are giving to the new gun shop the same expert attention which brought the shrapnel output of the Symington Machine Corp. from 27 in April, 1916, to 328,000 in November of the same year.

Shell Testing Machine

To meet the demands of the United States specifications for common steel shells, the Southwark Foundry & Machine Co., Philadelphia, has developed a hydrostatic shell testing press. The general arrangement of the machine is shown in the accompanying illustration.

Due to the fact that each type and size of shell requires a different test pressure, two basic designs were developed to which modifications have been made. The machine illustrated is for testing 75-millimeter or 3-inch shells.

The machine is purely hydraulic in its operation. It is of the two or three-column type, and has a revolving table suitably indexed, so that when one shell is being subjected to the hydrostatic test pressure (the maximum in the case of the 75-millimeter shell being 18,000 pounds) a second shell has been brought into position for inspection, while a third is being filled with water. The capacity of this machine, under ordinary working conditions is stated to be about 120 shells per hour. The testing operation is briefly described as follows:



SHELL TESTING MACHINE

The first movement of the single lever operating valve admits line pressure (1500 pounds) to the lower cylinder. This cylinder, moving upward, engages the slotted base plug in the revolving table and forces the open end of the shell nose into a patented sealing gland. When full pressure on the lower cylinder has been reached, line pressure is automatically admitted to the top cylinder, which is arranged with an intensifier ram projecting through a packed gland in the stationary crossmember into the open nose of the shell, which having been previously filed with water, acts as the high pressure intensifier cylinder. The pressure is instantly raised to the predetermined amount, and is read direct by a gage communicating with the chamber intervening between the circular shell nose and the intensifier ram. The high-pressure of test is developed only in the body of the shell, all other parts of the machine, including the operating valves, piping and cylinders, are not subjected to a higher pressure than 1500 pounds per square inch.

Magnet Salvages Pig Iron

A collision last March between a barge of the Arrow Transportation Co. and a pier near Paducah, Ky., dropped about 420 tons of pig iron into the Tennessee river. The insurance company paid about $10,000 to cover the loss and set about to recover its money. The company fitted a barge with a crane and a 43-inch lifting magnet purchased from the Cutler-Hammer Mfg. Co., Milwaukee, and dragged the river bed in the vicinity of the accident. About 400 tons of the iron were recovered and the increase in price netted a profit of about $2000 with all the recovery expenses paid.

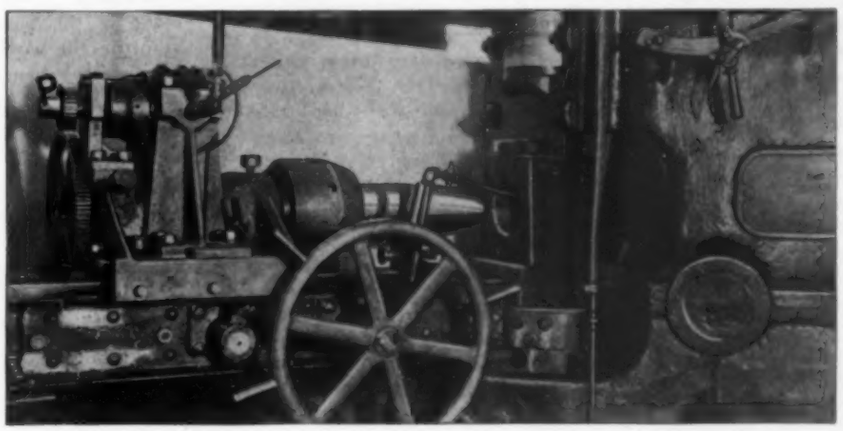
The standardization committee of the American Society of Mechanical Engineers reported at the annual meeting that its most important activity has been its work in connection with the creation of an American engineering standard committee. Active in this work were jointly the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society for Testing Materials. Delegates from these societies created an executive committee consisting of one member from each and this committee reported a constitution and by-laws to the main joint committee, which latter accepted the report and caused it to be sent to the founder societies for their action.

A new 2-story welfare building, 50 x 150 feet, will be built by the American Smelting & Refining Co., Perth Amboy, N. J.

Conforming a Shop to Shell Making

Improvised Machines and Methods Necessary to Shell Production in a Small Machine Shop—How One Plant Met New Conditions —A New Method of Nosing Shells

GRIM necessity has always developed engines of war as needed, and in war times industry is inevitably goaded to intensive effort to plan the practical construction of machines, guns and munitions. Early in the present war a shell was a curio in this country, known only to those in the army or acquainted with army affairs. As Europe's needs increased, we received our elementary course in making guns and shells. This training was of the greatest value and has prepared the way for the present, and for that time when, if necessary, every small town machine shop may be a munition plant. The Elyria Machine Co., Elyria, O., entered the munition game early. The machine shop in Elyria soon proved inadequate to handle the orders which were received from Belgium, so a plant of the Buffalo Pitts Co., Buffalo, N. Y., was leased and rearranged. In this plant the Elyria company manufactured a variety of shells of the French type, that is shells with a longer taper than the British shell and of course designed according to metric measurements.



GENERAL ARRANGEMENT OF PATENTED SHELL-NOSING MACHINE

Special machinery was improvised to meet the numerous difficulties which arose. Gas furnaces were built to provide for heat treatment processes, and special types of these furnaces were designed to heat the ends of the shells for nosing, without placing the entire shell in the furnace. To accomplish this, the shells were shoved through circular openings in the door of the furnace. These openings were of a diameter just sufficient to admit the shell to the point where it had been machined ready for nosing.

A peculiar condition necessitated a change in the process of nosing these French type shells. Under ordinary practice the shell forging, after being centered and rough machined, is placed vertically, base down, under a hammer or press. A die, shaped to the measurements of the shell nose is forced down over the forging until the shell is compressed to the taper required. This might be called a swaging process. The force is applied vertically to the long axis of the shell.

This process is generally used in English shell-making practice, but objection was made to its application to manufacture under French specifications. An English shell of 6-inch diameter has 7/8-inch of metal at its thinnest section The 155-millimeter French shell which approximates 6.08 inches in diameter has only 5/8-inch in the corresponding section. It seemed probable that hammering along the long axis of the shell might cause a buckling along the plane of the weakest section or bourrelet. Or if this failure did not develop, it was feared that on firing, the tremendous impact on the base of the shell might cause it to spread due to weakness set up in nosing. This action might be compared to the opening of an umbrella when the end is struck or dropped to the pavement. This spreading would result in the shell's jamming in the gun and a probable explosion would ensue under action of the fuse.

To meet the difficulties in nosing, R. J. Wehland of the Elyria Machine Co., developed a machine for applying the force perpendicularly to instead of along the axis of the shell. This machine is shown in the accompanying illustration. It consists essentially of a steam hammer with two dies, and a movable carriage which feeds the shell between the dies and rotates it between strokes of the hammer. The lower die is rigid. The upper one is impelled against the shell with a 1-inch stroke at the rate of 125 times per minute. The machine is shown completing the tapering of a 155-millimeter shell.

The shell base is held in the block on the carriage or feeding machine. Rotation is induced by a compressed air motor working through the small pinion, *P*, to the large gear which rotates the clamping device by which the shell is held. This rotation is at a constant rate. The entire carriage is moved forward by means of a large hand wheel until the nosing attains the form desired. The hammering is perpendicular to the long axis of the shell and the only force delivered along the axis of the shell is that forward movement on the table by which the carriage is moved forward by the wheel when the shell is fed into the dies. This method of nosing proved successful and several similar machines are in use at the present time in this country and Canada.

The Elyria Machine Co. has received a contract for finishing a large number of French-type shells for American guns. The shells are to be made from forgings of 0.60 per cent carbon steel, which will be supplied. The blank weighs 162 pounds and after finishing the shell will weigh 75½ pounds. No heat treatment will be given.

A nosing machine similar to the one just described will be used, but instead of a steam hammer a forging press manufactured by the Toledo Steel Casting Co., Toledo, O., will be employed.

A 15-ton open-hearth furnace is being installed in the plant of the Atlas Crucible Steel Co., Dunkirk, N. Y., by Wellman-Seaver-Morgan Co., Cleveland.

A department for the handling of relaying rails and second-hand railway equipment, has been opened by the Ohio Iron & Metal Co., with offices in First National Bank building, Chicago.

How Erosion is Caused in Big Guns

A Discussion of the Major Factors That Destroy Gun Rifling—Among the Remedies Suggested Are the Use of Unsoftenable Steels and the Adoption of Removable Gun Liners

BY DR. HENRY M. HOWE

THIS paper is based in large part on the examination of two rings cut from an eroded 14-inch gun liner, and containing, according to Booth, Garrett and Blair: Carbon, 0.380 per cent; manganese, 0.655 per cent; nickel, 2.810 per cent; vanadium, 0; chromium, a few hundredths of 1 per cent; tungsten, 0; molybdenum, 0.

These rings were received by the author from Admiral Joseph Strauss, then chief of ordnance, United States navy, through the kindness of Hudson Maxim, chairman of the committee on ordnance and explosive, of the United States naval consulting board. The gun from which these rings were cut was 53 feet 6½ inches long over all, and had been worn out at the proving ground by firing 170 rounds. The rear ring was cut at the origin of rifling, the forward one at 207 inches from the breech face, or about one-third way from the breech to muzzle. I understand that these guns weigh 63 tons, and fire a shell weighing 1400 pounds with a muzzle velocity of 2600 feet per second and a muzzle energy of 65,000 foot tons. The erosion has been marked in the forward ring, while in the rear one it has erased the lands almost completely.

Destruction of Rifling

The rifling consists of a series of lands or spiral projections from the bore of the gun. The projectile, through its copper driving band, engages these projections and is thus set spinning clockwise about its axis.

Two strong agencies tend to erase these projections, and thus to erode the bore the scraping of the driving band and the rush of white-hot gases and perhaps liquids, and of incandescent and yet ungasified explosive. These may for our purpose be grouped together as the gases. The scraping effect of the driving band is due to its combination of extremely rapid motion with tangential pressure great enough to overcome the resistance of the projectile to receiving a rapid rotation. The seriousness of this scraping effect is easier to conceive than that of the rush of the gases. We may get some notion of this latter from the fact that its eroding effect is greater than that of the driving band.

That even fluids have great erosive power is shown by the strong cutting action of filtered water escaping from under great pressure, as at leaks in hydraulic apparatus. The thickness of the layer eroded in each round from a 12 or a 15-inch gun is about 0.0005 inch, according to Mr. Maxim.

Erosion must needs increase rapidly with the size of the gun and the weight and velocity of the projectile. The heating effect must increase with the length of the gun because this implies a longer exposure to the hot gases. To vary Sir Frederick Bramwell's illustration, to pass from a 6 to a 12-inch gun and to double all linear dimensions would increase the weight of the powder eight fold, while only doubling the inner circumference. The corresponding increase in the weight and velocity of the projectile would increase its torque greatly, and hence the total tangential pressure of the driving band on the lands, while only doubling the circumference available for lands. With even 7-inch muzzle-loading guns of 7 tons weight, with 30 pounds of powder and a 115-pound shell, erosion became serious.

Erosion is accompanied by the hardening and cracking of the face of the bore, the main cracks being longitudinal in the grooves and transverse on the lands.

Time Analysis

Let outer and inner, outside and inside, respectively, refer in every case and under all conditions to parts farther from the axis and nearer to it. Thus the outer face of the hardened layer is the face farther from the axis, and its inner face is that nearer the axis, the bore face.

If the velocity of the projectile through the 36 feet from the forward ring, which the author examined, to the muzzle was equal to the muzzle velocity of 2600 feet per second, then the length of time between its passing that ring and escaping into the air would be 0.014 second. But as there is very appreciable acceleration during this travel, this period may be taken as of the order of 0.02 second. This is in rough accord with the data of Mr. Maxim that the projectile stays in a 12-inch 45-caliber gun a total time of about 0.062 second, and of Admiral Earle that about half the time is occupied in moving forward the first caliber. The total time of travel for such a 12-inch gun is given by others as 0.0471 second.

Because the length of time increases

Save Our Guns

On the life of our big guns hangs victory or defeat. At this critical time in the world's history it is gratifying to know that our guns are as efficient as it is possible to make them and that no country whatsoever has yet produced guns that have shown longer life. As stated in THE IRON TRADE REVIEW, *March 1, 1917, it has been fashionable to emphasize our lack of naval preparedness by giving credence to stories to the effect that our high-power battleship guns are worn out and unfit for service. These stories are both absurd and erroneous. Many of our big guns, so states a prominent naval officer, have been fired 1.6 times the theoretical number of rounds with no diminution in range or accuracy.*

The average layman is aware of the fact that the life of a modern gun is comparatively short, owing to the erosion of the rifling lands caused by the passage of the projectile and burning gases. In THE IRON TRADE REVIEW *of Dec. 14, 1916, Henry Fay's paper on the erosion of guns was published. This paper was read at the February, 1917, meeting of the American institute of Mining Engineers, where it attracted much attention. The present paper by Prof. Howe treats of the same subject and he draws some interesting conclusions. Also, he offers suggestions for lessening erosion, among them being the adoption of a less erodible metal for gun linings.*

Abstracted from a paper to be presented at the February meeting of the American institute of Mining Engineers. The author, Henry M. Howe, one of the most widely known metallurgists in the world, is emeritus professor of metallurgy, Columbia University, and metallurgist attached to the bureau of ordnance, war department.

roughly with the caliber, these two estimates of the time of travel would correspond to 0.07 and 0.05 second, respectively, for a 14-inch gun.

The Hardening of the Bore

After even as few as five rounds have been fired, the surface of the bore is found to be hardened. At first this hardened layer is confined to the rear of the gun, where the heating has been longest and highest. As firing progresses, it thickens and extends further forward, decreasing in thickness from breech to muzzle, where in the early stages it may be confined to a very thin layer on the driving edge of the lands. The hardened layer is the light narrow band, about ⅛ inch wide.

While in the rear ring I examined it is an annulus of nearly uniform thickness, as would be inferred from the almost complete effacement of the lands, in the forward one it is greatly thickened at the salient angle of the driving edge, and thinned correspondingly at the re-entrant angle.

That this thin hardened layer consists of martensite has been reported independently by Belaiew and Rosenhain, and has been confirmed by Fay. This martensitization, of course, can come only from rapid cooling and is more likely to represent rapid cooling from a decidedly higher temperature. In the section cut from a 4.7-inch rapid-firing gun tube examined by Roberts-Austen and Osmond, the martensite could not be definitely identified, but Professor Fay's identification seems to be complete, first in that his hardened layer was changed into troostite on heating to 300 degrees, and second in that he detected the martensitic structure. Hence it certainly represents the heating of the surface of the bore, followed by a cooling so rapid as to catch the metal in the intermediate state of martensite, by denying the time necessary for the transformation in cooling to go farther. This is wholly concordant with the long-known fact that the transformation from the alpha or pearlitic to the gamma or austenitic state is extremely rapid, while the reverse transformation is relatively slow. It is quite parallel to the hardening of the surfaces of rails by the slip of the driving wheel, and to that of the surface of a rolling-mill roll which slips past the surface of a sticker. In each case a thin layer of surface is heated above Ac_1 and thus converted at least partly and probably completely into austenite, and is immediately re-cooled by conduction to the cold mass of outer metal too rapidly to permit the transformation from austenite back toward pearlite and ferrite to go beyond the martensite state.

Starting with the sorbite, or very intimate mixture of microscopic particles of ferrite with cementite, of which the gun lining consists initially, its hardening consists of two wholly distinct necessary steps. First, the individual particles of ferrite and cementite merge to form a single substance, austenite. It is only at high temperatures that this merging is possible. Second, during the rapid cooling this austenite transforms into martensite. This martensitization is the essence of hardening, and the hardened layer owes its hardness to its being martensite. Martensite can form only during the rapid cooling of austenite, so that the merging to form austenite is absolutely essential to the hardening. Hence, given the rapid cooling which inevitably occurs in the gun liner, it is only in that layer in which the ferrite and cementite have actually merged and formed austenite that hardening can occur.

It is only at the very contact between adjoining particles of ferrite and cementite that this union can begin, quite as a mixture of salt and water can unite only at the surface of the various grains of salt. The austenite layer thus formed about each grain immediately begins dissolving an additional layer from these same particles of ferrite and cementite, quite as the brine between the grains of a mixture of ice and salt begins dissolving both ice and salt at the surface of the various grains. In effect it is by entering the intervening brine that the salt and ice of the layer which is now dissolving from each grain reach each other and thus react on each other and bring each other to the liquid state.

Erosion is generally referred chiefly to the gases and only in minor degree to the scraping action of the driving band. This is reasonable in view of the facts, first that the metal at any given transverse section is exposed incomparably longer to the rush of the gases than to the driving band, and second that the steel is incomparably hotter during most of its exposure to the gases than during its contact with the driving band.

The relation between the erosion of the lands and that of the grooves tallies with this belief. If the driving band did most of the erosion, then the lands should erode incomparably faster than the grooves, because the driving band, in becoming engraved upon the rifling, must press much harder on land than on groove. Consider a round rubber cork pressed into the neck of a bottle, ribbed on its inside.

We should not go so far as to suppose that the copper of the driving band does not reach the grooves, because the copper network in them seems to disprove this. That on the lower side of the bore might indeed have run into the cracks in a molten state during the contraction period, but that on the upper side cannot readily be explained thus. But the actual excess of erosion of land over groove is about that which we should expect from a higher temperature of the land, and the stronger rush of the gases past it.

Remember, too, that, after a few rounds, because of the progressive decrease of erosion from breech toward muzzle, the space into which the driving band has to fit is in effect tapered chokingly in this same direction, and further that because this erosion is greater on land than on groove, the taper or gradient too is stronger on land than on groove. This stronger gradient of the land would tend continuously to keep the copper out of contact with the grooves, or at least to lessen the pressure at that contact.

Grooves Not Copper Filled

The copper mouthful hypothesis leads us to expect every crack to be filled flush with copper at each round. We saw that the copper filling of any given crack was not a single firmly coherent

Unsoftenable Steel Suggested

If steels which cannot be softened in order to facilitate machining, such as tungsten, molybdenum and manganese steels, should show great resistance to erosion in preliminary tests, a possible way of using them, Prof. Howe suggests, would be to restrict them to the rear part of the gun, where the erosion is most rapid, to cast the rifling in and to take a light finishing cut with a grinding wheel. If the life of great guns is as brief as we have sometimes been told, then if we had a substance far more resistant to erosion than our present gun steel, but very expensive to machine, it might be wiser to use it in the rear of the gun and machine it only roughly to dimensions, in view of the fact that in present practice the rifling retains its initial accuracy for only relatively few rounds, after which it degenerates greatly through erosion. The fact that the gun gives by far a greater part of its useful service after it has lost its initial accuracy of rifling proves that this accuracy is not essential to usefulness.

mass. This hardly surprises us. When a crack opens during the period of cooling and contraction, its present copper contents may well become coated with oxide, carbon, or ash, of which the thinnest layer will suffice to prevent it from becoming firmly attached to the copper mouthful next bitten off, great though the pressure is which forces them together in the immediately following expansion period. Again, the copper may well be prevented in the same way from becoming firmly attached to the steel walls of the crack. Moreover, the difference between the coefficients of contraction of steel and of copper might well tend to separate them during this contraction, and indeed the forcible opening of the jaws then detaches the copper from one face of its crack, and might weaken its hold on the other. Hence we are not surprised that certain cracks fail to retain their last mouthfuls of copper, which is all that is meant by their not being filled flush.

We naturally expect it to by increasing the heating up of the steel near the bore, by means of the heat of the gas which enters the cracks. I doubt whether it has an important effect in this respect, because the hardened layer does not follow down the sides of the cracks, as it would in case there was an important entry of hot gas into them.

Indeed, the longitudinal and transverse cracks should, in a sense, lessen the tangential and longitudinal stresses tending to burst the gun. In a material which does not crack, tensile stresses, both longitudinal and tangential, would remain at the end of the cooling, of such intensity that, if unopposed, they would now create cracks the width of which would represent the contraction in that cooling. These stresses in an uncracked tube, and the cracks in a cracked one, in effect lessen the sum of the tangential and longitudinal stresses, respectively, tending to burst the gun, because they take up the expansion which the bore face undergoes because of its heating, and to that extent prevent it from adding to the sum of the stresses developed by the gas-pressure.

Palliatives of Erosion

In view of the slowness with which such an isotherm can be induced to travel into a mass of steel which we heat in a furnace at, say, 1000 degrees, the temperature which the bore face itself must reach in order to induce so rapid an outward travel of this isotherm should be extremely high, because the rapidity of movement of an isotherm increases with the steepness of the thermal gradient behind it. It would be surprising if the temperature did not reach the solidus, about 1350 degrees for gun-liner steel, and it may well reach the liquidus, or even a much higher temperature.

The driving band exerts very great pressure, but this is before the face of the bore has been heated highly by the exposure to the hot gases. The temperature of the bore face continues to rise rapidly after the driving band has passed, because of the now direct exposure to the hot gases. Their velocity and pressure are so enormous that they probably scrape forward and detach not only the metal which is actually above the solidus, but also that which is at a temperature of great softness shortly below the solidus. The pulling away of each particle implies overcoming the cohesion which holds it to those left behind, and hence the resistance of the metal to erosion should increase with its cohesion, and hence with its hardness, which is simply the name which we give to a varied group of manifestations of cohesion. We set aside certain manifestations of the cohesion of the whole section of a test bar under such names as tensile strength, compressive, shearing, transverse, and torsional strength, and we group together most or all of the remaining manifestations of cohesion as hardness whether they are manifested in a scratching test such as that of Turner's sclerometer, or in a compressive ball test like Brinell's, or in a wear test, or in the rebound of a test hammer like Shore's, though these tests have little more in common with each other than they have with the determination of the tensile strength. It so happens that most of these manifestations of cohesion which we group together as hardness have to do chiefly with the superficial parts of the specimen, but this distinction is not applied consistently, as for instance when we say that an armor plate is hard from face to back. Hardness, then, is a heterogeneous collection of unselected manifestations of cohesion.

Big Guns Erode Rapidly

Erosion must needs increase rapidly with the size of the gun and the weight and velocity of the projectile. The heating effect must increase with the length of the gun because this implies a longer exposure to the hot gases. To pass from a 6 to a 12-inch gun and to double all linear dimensions would increase the weight of the powder eight fold, while only doubling the inner circumference. The corresponding increase in the weight and velocity of the projectile would increase its torque greatly, and hence the total tangential pressure of the driving band on the lands, while only doubling the circumference available for lands. With even 7-inch muzzle-loading guns of seven tons weight with 30 pounds of powder and a 115-pound shell, erosion became serious. With modern guns it is a tremendous problem.

Erosion Resisted by Hardness

Because resistance to wear is a manifestation of cohesion and thus related to the other forms of hardness and strength, we naturally infer that white hardness should oppose erosion, which after all is only a special form of wear.

Because the rushing gases sweep forward not only the metal actually melted but also that which is erodibly soft, erosion is resisted not alone by a high melting point but also by what I venture to call "white-hardness," hardness at a white heat and even when near the solidus. White-hardness thus is a quality comparable with red-hardness.

It seems too much to hope that the velocity and pressure of the gas stream in the bore shall be great enough to give the projectile its enormous velocity in a trifling fraction of a second, and yet shall not be able to tear away some solid particles from the face of the bore. Add to these the enormous temperature developed, and our wonder rather is that the erosion is not greater.

The ways of lessening erosion are:

1.—To reduce the temperature by devising an explosive which shall deliver more of its energy in the form of pressure and less in the form of temperature. On this point the metallurgist may well hold his peace, especially because a large part of the present pressure must be a result of the high temperature.

2.—By lubrication, for instance with graphite, which should be affected but little even by this high temperature.

3.—By devising ready means of drawing and replacing the gun liner. To the layman this seems incomparably the most promising means. With electricity as a ready means of heating and expanding the body of the gun, and carbonic snow and liquid air as ready means of contracting the liner, and with graphite to lubricate it, surely our present mechanical engineers should be able to pull an old liner out and push a new one in, in view of the antiquity of the invention of shrinking a tire upon a wheel.

4.—By using a less erodible metal. This is the only palliative I would venture to discuss.

Because a high melting point is evidently of very great importance, we naturally turn to alloys of iron with metals more infusible than it. Of these there are only four, tungsten, molybdenum, vanadium, and titanium, which are to be had in quantity and at a price that makes them worth considering.

One of the most intelligent makers of high-speed tool steel informs me that tungsten raises the "pouring temperature" at the rate of about 11 degrees Cent. per 1 per cent of tungsten. This

does not necessarily conflict with the inference which Guertler draws that "the melting point of iron should be lowered little at the first by tungsten."

Guertler's "preliminary and hypothetical" diagram of the iron molybdenum alloys implies that even the liquidus is lowered by an addition of some 22 per cent of molybdenum to about 80 degrees Cent. below the melting point of pure iron, and that it is not till the molybdenum content reaches about 42 per cent that the liquidus again rises as high as the melting point of iron.

Titanium is even less encouraging, for additions of it up to 13 per cent lower the liquidus rapidly and the solidus extremely rapidly, bringing it down to 1300 degrees, or 230 degrees Cent. (446 degrees Fahr.) below that of pure iron, when the titanium content reaches 6 per cent. The solidus remains at this temperature at least till the titanium content reaches 19.90 per cent.

Vanadium, too, lowers the melting point of iron, though by no means so rapidly. A vanadium content of about 33 per cent is reported to lower both liquidus and solidus to about 1440 degrees.

Manganese steel has shown surprising endurance of conditions closely like those of the lands, in its use as a pipe ball in lapwelding tubes. Here the white-hot steel skelp under very great pressure is scraped very rapidly over the face of the ball, much as the white-hot gases of the gun rush past the surface of the land. In both cases we have rapid frictional motion under great pressure at a very high temperature.

Why manganese steel is so endurant under these specific conditions we do not know. Indeed, its relatively low thermal conductivity and specific heat might at first seem to work against its endurance, if we should forget that these properties as we determine them in other steels are those of the pearlitic state, and hence give little suggestion of what they are in the austenitic state in which erosion is resisted. Against manganese steel must be weighed its proneness to oxidize, and the very great cost of rifling it.

If any of these steels which cannot be softened in order to facilitate machining, tungsten, molybdenum, and manganese steels, should show great resistance to erosion in preliminary tests, a possible way of using them would be to restrict them to the rear part of the gun, where the erosion is most rapid, to cast the rifling in, and to take a very light finishing cut with a grinding wheel. If the life of great guns is as brief as we have sometimes been told, then if we had a substance far more resistant to erosion than our present gun steel, but very expensive to machine, it might be wise to use it in the rear of the gun, and machine it only roughly to dimensions, in view of the fact that in present practice the rifling retains its initial accuracy for only relatively few rounds, after which it degenerates greatly through erosion. The fact that the gun gives by far the greater part of its useful service after it has lost its initial accuracy of rifling proves that this accuracy is not essential to usefulness. Toward the muzzle of the gun the machining may be more accurate.

Ohio is the Leading Tool Builder

ACCORDING to statistics recently published by the bureau of the census, United States department of commerce, Ohio ranks first among the states of the nation in the production of machine tools. Rhode Island is second, and Connecticut and Massachusetts are third and fourth, respectively. The figures on which this listing is based appear in the accompanying table compiled from the census of manufactures for 1914. They are of especial interest because for the first time in the history of the census, the statistics of the machine tool industry have been shown separately. Heretofore the information regarding machinery has been incorporated under the heading, "Foundry and Machine Shop Products", a classification so broad that it had no significance to men of the machine tool industry.

Ohio, with a production of machine tools valued at $9.014,178, has produced almost one-third of the tools made in the United States. However, by grouping Rhode Island, Connecticut and Massachusetts under the classification "New England", the eastern community has an output of $10,003,-024, which is over 33 per cent of the total.

It is unfortunate that the early census reports did not contain statistics with which the possible figures could be compared. Such figures, if they existed, would serve as a basis for comparing the growth of the machine tool industry of the middle west with that of New England. However, even without the early statistics, the output of machine tool plants in Cincinnati, Cleveland, Toledo and Dayton, reached a point in 1914 slightly in advance of that of manufacturers in Providence, Hartford, Worcester and New Britain in New England's great toolmaking center.

Machine Tool Output in 1914

	Machine tools*	Metal working machinery†
Ohio	$9,014,178	$2,909,389
Rhode Island....	3,679,190	174,490
Connecticut	3,280,940	2,407,987
Massachusetts ..	3,042,894	859,608
Pennsylvania ...	2,466,198	4,069,278
Illinois	1,935,861	1,902,651
New York.....	1,782,494	3,160,369
New Jersey.....	1,558,412	546,346
Michigan	1,179,761	280,564
Wisconsin	1,004,812	209,052
All other states.	2,501,920	899,792
Total in U. S...	31,446,660	17,419,526

*Machines which employ a tool for working on metal.
†Other than machine tools.

Other items of machines, mentioned in the census report, include metal working machines, other than machine tools; air compressing, mining, pumping and woodworking machinery.

As shown in the accompanying table, Pennsylvania leads in the manufacture of metalworking machinery not classified as machine tools, and also in the manufacture of air compressing and mining machinery. Massachusetts leads in the manufacture of pumps and pumping machinery; and Wisconsin, presumably because of its Racine and Milwaukee industries, leads in the production of woodworking machinery.

Manufactures Supply Gages

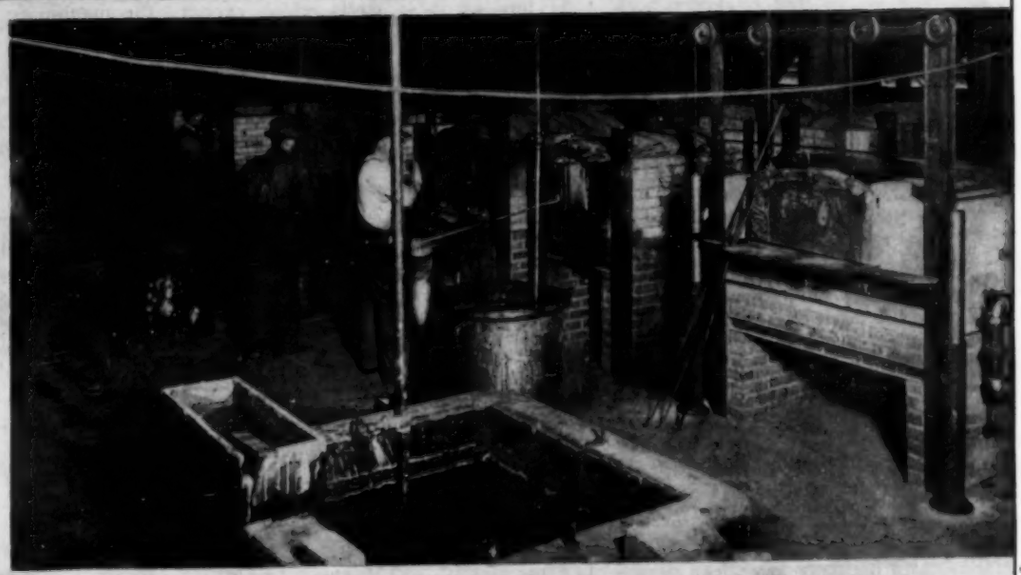
When the ordnance department contracts for munitions it is customary for manufacturers to supply the gages necessary. The government furnishes a set of master gages to the manufacturer and to all inspectors. They are kept at the factory and are used for checking the inspection gages. The gage inspection work is assigned to Major L. A. Fischer who organized the gage inspection service at the time he was connected with the division of weights and measures.

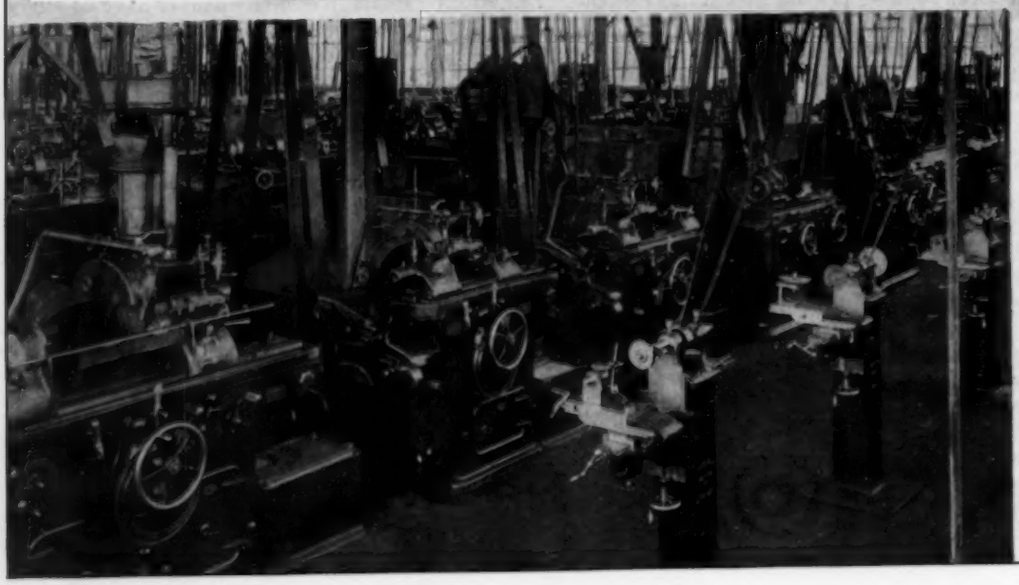
Great importance attaches to the prompt and adequate supply of gages as the speeding-up of all munition work is dependent upon this factor. This was brought out by Capt. Richard J. Durley of the imperial munitions board of Canada at the annual meeting of the American Society of Mechanical Engineers. Notable progress has been made since we entered the war in supplying these gages.

Tool Grouping Fosters Efficiency

Accompanying are Views Taken at the Cleveland Milling Machine Co., Cleveland, Maker of Machine Tools and Milling Cutters

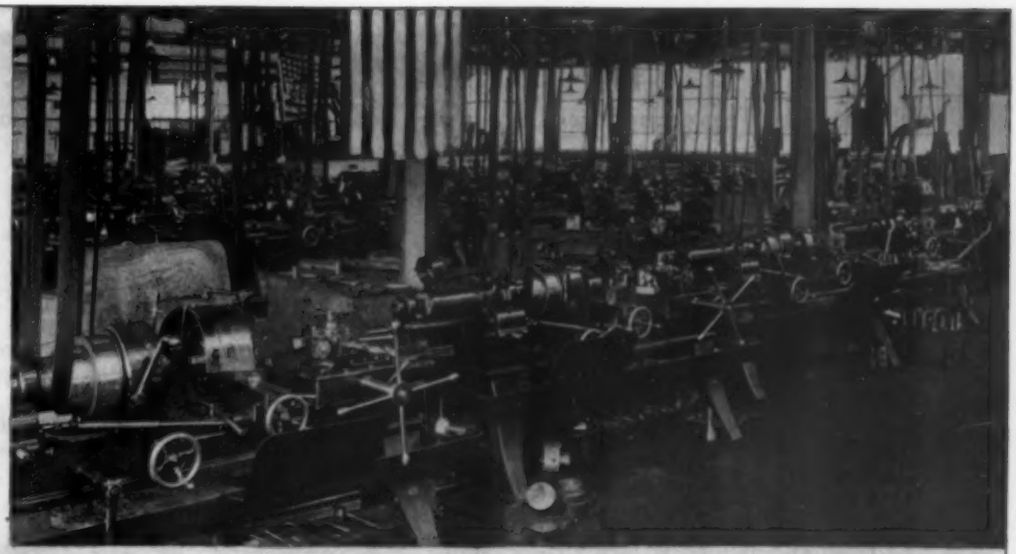
Above, Groups of Relieving Machines and Lathes for Rough Turning are Shown; at the Right, the Heat-Treating Department

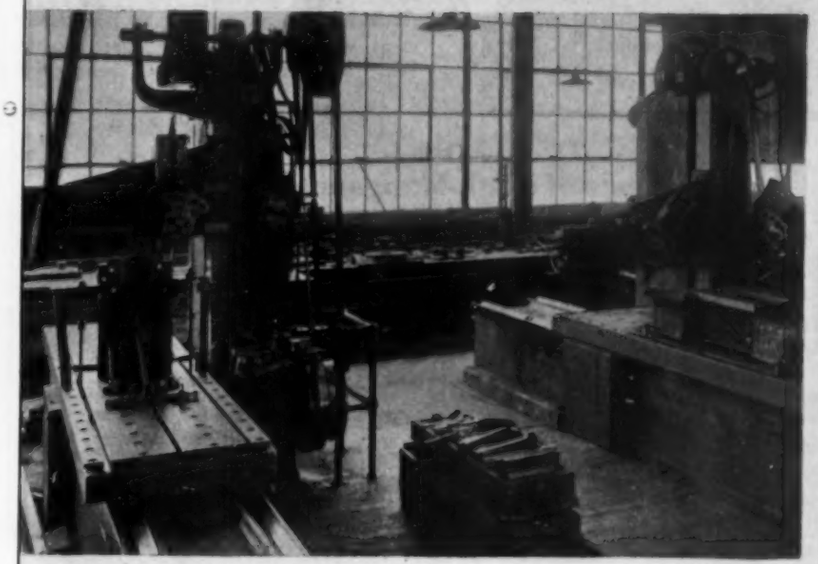




Wide Adaptability and Capacity for Taper and Miscellaneous Tool Grinding is Suggested by This View of the Grinder Section

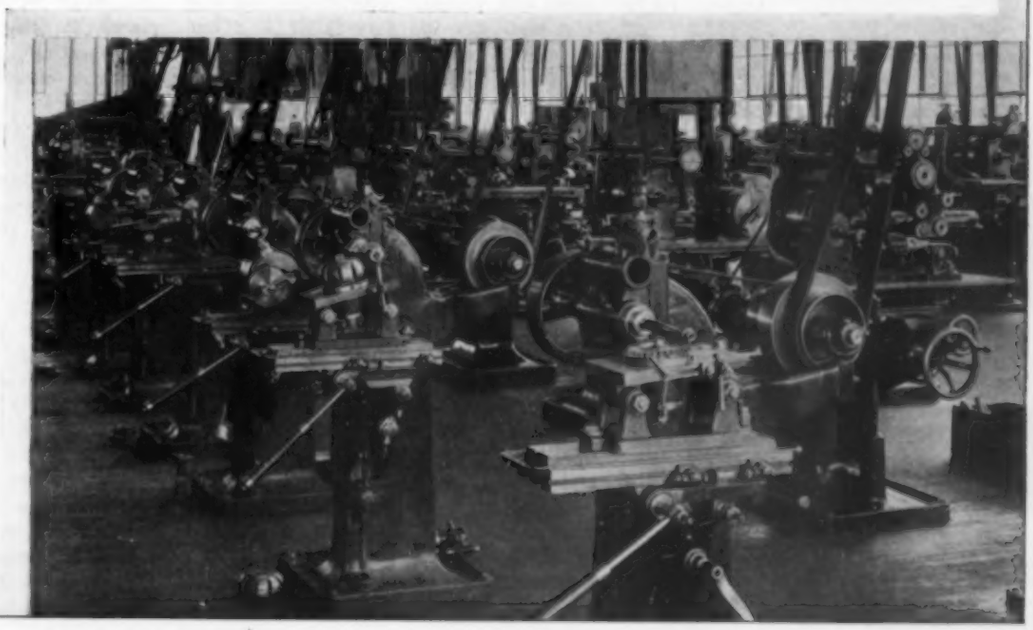
Boring, the First Operation in Making Milling Cutters is Performed on the Turret Lathes Illustrated at the Right





Heavy Planer Equipment that Permits Quantity Production of Milling and Relieving Machines

View of Hand and Power Feed Milling Machines Where Teeth are Gashed in Cutter Blanks, Preliminary to Relieving and Hardening



The Time Effect in Tempering Steel

A Uniformly Tempered Steel is Imperative in Rifle Barrels Owing to the Difficulty of the Barrel Drilling Operation—A Few Tests of Physical and Chemical Properties

BY A. E. BELLIS

THE time effect in reheating certain steels below the critical range is marked. The increased toughness, shock-resisting power, and machinability of steel subjected to a long, high drawing temperature has been thoroughly demonstrated and is of practical importance, particularly in the manufacture of "smokeless" rifle-barrel steel.

The time effect in tempering is most important when a maximum drawing effect is desired, in which case maximum physical properties as well as ease of machining are important considerations. These are the conditions in drilling a rifle barrel. A hole, 0.30 inch in diameter and 24 inches long for the Springfield rifle, and 30 inches long for the Russian military rifle, must be drilled in the heat-treated material. This barrel drilling operation is probably the most difficult one in rifle manufacture, and anyone who has been connected with rifle manufacture knows how seriously production is affected when "hard" or un-uniform steel for barrels is encountered.

The physical properties of two different lots of barrel steel are given below. The first lot, No. 1, gave serious trouble in the drilling operation. The second gave no trouble at all.

	No. 1	No. 2
Elastic limit, pounds per sq. in.	117,450	116,800
Tensile strength, pounds per sq. in.	132,500	131,750
Elongation, per cent	16.0	20.0
Reduction of area, per cent	42.1	51.0
Impact strength, ft.-pounds per sq. in.	450.0	520.0

This difference in machining and physical properties was due entirely to the time of reheating. The first lot was given a reheating time of 30 minutes, the second lot remained at the reheating temperature two hours. Both lots had been oil-quenched from 1500 degrees Fahr. and reheated to 1180 degrees Fahr. The time required in the reheating or drawing for the work to come to temperature was not counted. This time was approximately 20 to 30 minutes. The steel used had the following composition: Carbon, 0.54; sulphur, 0.050; manganese, 1.22; phosphorus, 0.065.

The physical properties when untreated were found to be as follows:

Elastic limit, pounds per sq. in.	69,800
Tensile strength, pounds per sq. in.	128,700
Elongation, per cent	15.0
Contraction, per cent	35.2

Further experiments established the fact that at least a 2-hour reheating is necessary in order to have satisfactory machinability. Steel which, after treatment, gave elongation of 20 per cent or over gave no trouble in the shops. These results were substantiated by hundreds of physical tests and production reports on thousands of barrels.

A similar test with different heat lots of steel indicates that greater increase in machinability, ductility, and resilience can be obtained by making the drawing time still longer. The results of this test with drawing periods of 1, 2 and 3 hours, together with the results of another test made with drawing periods of one-half hour and 12 hours are shown in Table I. The latter test was made with the idea of producing the maximum time effect.

It will be noted that there is a decrease in the elastic limit and tensile strength as the drawing time is increased. This decrease, however, is slight compared to the relatively great increase in ductility and impact strength. The decrease of elastic limit of less than 1 per cent is accompanied by an increase of 25 per cent in ductility as measured by elongation, and 13 per cent increase in impact strength.

In order to determine whether this effect was largely due to the high manganese content of the steels, an ordinary machining steel of the same carbon content was given a similar test. The steel analyzed: Carbon 0.53; sulphur, 0.036; manganese, 0.65; phosphorus, 0.049.

Four specimens were oil-quenched from 1500 degrees Fahr., and drawn at 1180 degrees Fahr. for periods of ½, 1, 2 and 4 hours, respectively. The results are shown in Table II.

In all of these experiments, the standard test specimens were prepared from the bar stock *after* the heat treatment. The original diameter of the stock was 1 1/32 inch. The heat treatment was carried on in large production furnaces, temperatures being controlled with carefully standardized Wilson-Maeulen pyrometers. The reheating time was not counted for the first 20 or 30 minutes necessary for the pieces to reach furnace temperature. A reheating time of one-half hour, therefore, means at least 50 minutes in the furnace.

Since our measurements of strength, ductility, and resilience are not absolute, and because of the inherent structural variations in steel, we cannot make exact conclusions from a few tests such as are given here. From daily contact, however, we acquire knowledge of these properties which we cannot easily record, but of which we are certain. I regard this knowledge from experience the best evidence that increasing the time of reheating increases the ductility, toughness, and machinability of the particular steels herein described, to a degree well illustrated in the above tests. The excellent physical properties that can be obtained by properly heat-treating a machinery steel containing 1 to 1½ per cent manganese are not realized.

Table I

Tests of High-Manganese Steel

	Reheating Time				
	1 hr.	2 hr.	3 hr.	½ hr.	12 hr.
Elastic limit, pounds per sq. in.	124,250	121,600	116,250	115,500	98,750
Tensile strength, pounds per sq. in.	137,000	135,600	125,900	135,400	116,500
Elongation, per cent	17.0	17.5	19.0	17.5	22.0
Reduction of area, per cent	42.2	45.4	47.6	52.7	57.2

Table II

Tests of Low-Manganese Steel

	Reheating time			
	½ hr.	1 hr.	2 hr.	4 hr.
Elastic limit, pounds per sq. in.	66,150	63,800	62,750	61,600
Tensile strength, pounds per sq. in.	101,250	98,250	97,250	96,600
Elongation, per cent	23.0	26.0	28.5	28.5
Reduction of area, per cent	60.8	67.5	65.0	65.8

From a paper to be presented at the February meeting of the American Institute of Mining Engineers, New York. The author, A. E. Bellis, is metallurgist, Springfield armory.

How to Keep Your Men Satisfied

A Symposium on Labor Problems to be Presented at February Meeting of American Institute of Mining Engineers Covers Wide Range—Human Element is Chief Factor

THAT labor in its various phases has become the predominant factor in industry today is reflected by the fact that at the 116th meeting of the American Institute of Mining Engineers, to be held in New York City, Feb. 18-21, practically an entire session will be given over to this subject. Day by day the human element enters more into consideration and voices are raised everywhere that labor is king. The Institute of Mining Engineers realizes the tendency of the times and the necessity for giving close study to what may develop into a serious situation for the country. It has given four men, each an expert in his respective line, an opportunity to present papers on various phases of the labor, employment and welfare problems. While in some cases, it would not be practicable for an enterprise to adopt all of the suggestions made in these papers, since they apply only to the larger corporations, modifications of the various plans proposed could be worked out to advantage. Each author treats of the human element in perhaps greater measure than has been before attempted. Some liberal extracts from these papers are given below.

In his paper on the problem of the reduction of labor turnover, Thomas T. Read, New Jersey Zinc Co., New York, says that the real solution lies in vesting an employment manager with sufficient official authority to handle such an important commodity as labor has come to be. It is no longer a question of purchasing labor, he says, but one of selling employment. Centralized hiring is advanced as the most effective means of reducing labor turnover costs. Comparatively little attention has been paid to the actual cost of labor turnover, but because efforts to eliminate excessive hiring and firing have been effective, the idea is spreading.

To make better men for the community as well as for work is the twentieth century evolution of the idea to make better workmen, and F. C. Stanford, Ishpeming, Mich., in another paper, shows how the Cleveland-Cliffs Iron Co. has overcome opposition and suspicion in giving employes an opportunity to fit themselves for positions higher up. Instruction is given in electrical installation together with training for positions of minor executive capacity such as shiftbosses and foremen.

Internal and external bodily cleanliness is the chief means toward conservation of life and health, according to Thomas Darlington of the American Iron and Steel institute, in his paper on Illness in Industry, Its Cost and Prevention. He states that records kept by those companies who give attention to the prevention side of workmen's compensation, show that the time lost by employes through illness ranges from four to ten times that lost as the result of industrial accidents.

That sociological work extending into the home life of the workman goes far toward bettering his attitude towards his work, and improves the feeling between employe and employer, is the contention of E. E. Bach, Ellsworth Collieries Co., Ellsworth, Pa., in his paper on social and religious organizations as factors in the labor problem. He states that ideas along this line should not be forced ready-made upon workmen, but seeds for their betterment should be planted in their minds and developments should be awaited with patience, even though the process may be slow.

Problem of Labor Turnover Reduction

BY THOMAS T. READ

LABOR turnover cost in industry is sufficiently large to justify the adoption of almost any means to bring about its reduction. Intensive study has revealed that faulty methods of hiring and discharging men is the most important factor of this problem. Complete control over the increase or decrease of working forces by a foreman is a relic of outgrown industrial conditions. Centralized hiring does not impair the foreman's authority and permits the work to be put on a scientific basis.

An employment manager, as a member of the modern industrial organization, has charge of the hiring of men for that entire organization. Recent growth of corporate industry where in some cases 20,000 to 50,000 men are hired in a year for one institution, has created the need for such specialists. Since labor represents more than half the cost of the finished product, it is more essential that labor shall be bought or, what is more pertinent, employment sold by a man having special knowledge, skill and aptitude than it is to have a purchasing department for raw materials. There are many other specific reasons why centralized hiring is desirable and profitable. In the first place, if hiring is done by foremen and the workmen are chiefly foreigners, it frequently transpires that the foreman is grafting on the men he employs, especially if labor is plentiful. It also builds up racial or religious cliques in a department that will make themselves felt in trouble later. This is inevitable, since the only source of supply a foreman has is through his friends and the friends of the men on his gang. There are too many foremen whose idea of discipline is essentially that of a slave-driver, and to allow such men to sell employment in their organization is little short of absurd.

An equally vital reason is that few

foremen make any systematic effort to fit a man to his job, although they would be the first to insist that a machine shop job cannot be well done with the wrong kind of tool. The foreman's chief duty is to keep up the output of his department and the hiring of men is merely an annoying necessity that he does not enjoy, so it is commonly performed in a perfunctory manner. If the applicant is a foreigner and does not speak English very well, asking him questions is productive of but little information about himself, for the chances are he only half-understands what is said to him and replies "yes" to every question, in the hope of making a good impression. So the foreman puts him on and "tries him out" with a lamentably low measure of success in most instances. Even if the man is not summarily fired, the foreman is seldom willing to devote much effort to teaching him. It should be mentioned here that many, perhaps most, cases in which a man is fired for disobedience to orders prove on careful investigation to be really a case of the man not understanding what he was told to do and taking a chance that he had guessed right rather than ask for more explicit directions.

The employment manager should have either at his own command, or among his assistants, all the languages spoken in the company working force, he should interview the applicants for work in circumstances and with surroundings that indicate to the man that he is going to get a "square deal", and by putting the man on at a simple job and transferring him he should be able to train the man up to higher grades of work.

Certain things are essential to success in centralized hiring of workmen. In the first place, the employment manager should be personally familiar with the work of the plant; if he has come up through the ranks, so much the better. He should be provided with rough specifications as to the kind of men desired for a given kind of work, since the foreman must be suited, and the foreman's ideas may differ from those of the employment manager. He should have notice as far in advance as practicable of the number of men desired so he can provide them when needed.

Description of Forms Used

The forms used in the successful conduct of an employment office are usually similar to the following: No. 1, requisition for help; No. 2, application for position; No. 3, medical examination card; No. 4, medical report; No. 5, hiring slip; No. 6, employes' record card; No. 7, employes' attendance card; No. 8, transfer card and No. 9, leaving slip. This last is taken to the employment office and another slip, No. 10, is issued before the man who is leaving or who has been discharged can secure his pay. In a modern organization no man is allowed to leave without a searching inquiry into his reasons for doing so, or until it is proved absolutely necessary.

Concerns who have conducted successful employment departments under employment managers include the following: The Saxon Motor Car Co., which reduced its labor turnover to 40 per cent of what it had been the first year of its operation; the Hayes Mfg. Co., Detroit, diminished its labor turnover one-half the first year and another half the second year, while the output per man increased 30 per cent; the Solvay companies, Detroit, reduced their labor turnover from 10 per cent per month in May, 1916, to 2.4 per cent per month in December, 1916. Other concerns who have tried the plan are unable to show results since no record was kept of what the turnover was costing them previously. The figures are truly amazing. For example, in such an organization as the Bethlehem Steel Co., labor turnover probably costs at least $3,000,000 per year.

The employment manager must be given sufficient rank, otherwise he cannot work effectively. In one case the employment manager reports directly to the vice president in charge of operations. In the case of the Jeffrey Mfg. Co., the employment manager is assistant secretary of the company, while with Fayette R. Plumb, Inc., he is assistant superintendent of the plant. A high type of man is required and the saving he is able to make justifies the cost of securing such a man.

Training Workmen for Higher Positions

BY F. C. STANFORD

HERETOFORE the engineer has concerned himself chiefly with physical forces and inanimate objects. He now has secured a truly marvelous degree of control over them. The great problem of the present age is to secure a like degree of knowledge and control of the human factor. The average of knowledge is not equal to the average needs of the present time and continually fails to keep pace with it. It has been aptly said that the really essential need of the period is for more brains; if we only had sufficient knowledge and sagacity we could not only solve all difficulties, but prevent them from arising.

This generalization holds good for an industrial organization. The most vital need of the management is for more brains. The logical course for an engineer in charge of an industrial organization is, therefore, to direct the forces at his command toward the development, training and guiding of all the brains in his organization. This is easier said than done, for it involves the carrying on toward two objectives, the maximum of productive work and the development of the individuals who perform it. On the other hand, if the aim is merely for maximum production from an organization, without offering opportunity for development, the final outcome will necessarily be like that of a plant that is driven at full capacity without stopping for repairs or improvements; it eventually becomes so run down that either a complete rebuilding is necessary or else it has to be abandoned.

If the best results are to be obtained, provision for the development of the individuals comprising an industrial organization must be made. With a small concern this is made easy by the opportunities for personal contract, but as the organization grows the problem becomes increasingly difficult.

A recognition of these general facts led the Cleveland-Cliffs Iron Co. to institute a definite provision for the training of its men to a higher level of mental capacity and efficiency. In February, 1912, an opportunity was given every man who so desired to take up a course of study which was then being prepared. Classes were formed in various subjects appertaining to the mining industry. The men applying were of many nationalities, very unequal in ability to master the work undertaken, and it was found impossible to form groups that could work along together in a satisfactory and successful manner. Two plans for training were finally adopted. The first was in the mechanical depart-

ment, for the purpose of training men to care for the electrical installation. The instructors were trained engineers connected with the department, who cheerfully gave their own time to this while carrying on their regular work.

The course in practical electricity and elementary mechanics covered a period of approximately two years, with class meetings one or two evenings each week during about eight months of the year. This class period usually lasted about 2½ hours each evening and, on account of the enthusiasm of the students in the work, it was frequently necessary to send the students home after the lapse of this time. About 40 students were enrolled in the first class of whom 28 were given diplomas. A considerable number came into the class so late that they were not able to finish the work, and these were carried into the second class. Many subjects were covered in the class work, including magnetism, electricity in motion, D. C. and A. C. generators and motors, wiring, etc. Several informal lectures were delivered on subjects closely identified with the work in hand.

No pressure was brought to bear in securing students other than presenting the idea that the best trained men will always be the ones to secure the best positions whether with this company or with other companies. Now we now have not one mine electrician, district foreman, or general foreman who has not taken the class work, and the effectiveness of the training given is clearly shown by the high class of work done and the minimum amount of trouble that occurs. It makes the men reliable in an emergency, because they know what to do and how to do it; also, they have measured their executive superior and feel that they can depend upon him for full support and help.

The second plan was for training mining men for positions of minor executive capacity such as shiftbosses and foremen. The instructor for this was employed for this specific purpose and while engaged in this work devoted his entire time to preparation and instruction.

When the second method of training was undertaken, it was necessary to select the right group, and it was finally decided to deal with English-speaking men only, who were recommended by their superintendents or mining captains for their ability and mining aptitude. The purpose of their training was to fit them to become shiftbosses or other minor executives. The first class consisted of 38 men, of an average age of 32 years, with an average of 4.3 years of schooling. It was thought best to teach one subject at a time, as being less confusing to the men than carrying on a number of subjects simultaneously. The following courses were taught in the order named: Arithmetic, elementary drawing, geometrical drawing, mechanical drawing, geology, construction and use of mine maps, first-aid to the injured, timekeeping, mine sampling, mine methods and business correspondence. All the class work was done on the miners' own time, for which they received no remuneration. In order to provide for changing shifts, there were afternoon and evening classes, and the men attended whichever was practicable twice a week, the periods being 1½ hours each for 1½ years. Of the 38 men who began, 33 finished the course successfully. Probably this measure of success was due to the avoidance of the formal atmosphere of an ordinary classroom and the cultivation of a personal friendship between the instructor and students. This is essential in this kind of work.

Illness Prevention in Industry

BY THOMAS DARLINGTON

THE obligation of an employer to the state requires certain things of him as matters of good citizenship: for instance, that his workmen shall have a living wage, that child labor shall not be employed, that injuries from accidents shall not make workmen a charge upon the state, etc. Affairs of this kind are not taken up as philanthropy, for the officials of a corporation or a large manufacturing concern may not feel at liberty to spend the funds of their company as prompted simply by motives of kindliness; but they may spend company money on such matters because it is good business.

For years the poisonous effects of lead, phosphorus and dust have been emphasized, and their elimination has been urged; but the more important and every day physiology of the workman himself has been neglected.

Importance of Health to Workmen

Some measure of the importance of health in industry can be gained by the knowledge that the records kept by those companies which now make this the subject of careful inquiry shows that the time lost by employes, through illness, ranges from 4 to 10 times that lost as the result of industrial accidents. As a matter of fact, illness in industry already has an effect on operating costs that is far from being generally realized. Whenever a man is absent from his work because of illness, it is essential to have a substitute who is unavoidably a less efficient workman; he makes a smaller output for the day's wages, he spoils more raw material and requires more supervision from the foreman. Many other items enter here into this question of costs so that the illness of the workman is not, therefore, a matter which concerns himself only, but is a source of direct loss to his employer. The cost of health supervision is not large, as is shown by the comparison of the cost of health supervision in 99 industrial establishments, employing altogether 495,544 men, made recently by M. W. Alexander, for the Conference Board of Physicians in Industrial Practice. The figures vary rather widely, since some plants reported only the medical cost while the majority included the cost of clerical assistants and even of janitor, and scrubwomen. The average cost per man per year for the half million employes was $2.50.

If, then, health is so important to industry, we must know the conditions under which it may be enjoyed. We may consider the subject under three heads, namely: Personal hygiene, or care of themselves by employes; care of employes by employers, and care by federal, state or municipal authorities in the making and enforcing of laws.

Fatigue Should Be Avoided

Under the first head, the principal factor leading to a high conception of personal hygiene is bodily comfort which, to a great extent, means the avoidance of abnormal fatigue. Fatigue is caused by anything that interferes with the carrying of oxygen to the tissues. This may be a diminished amount of oxygen in the atmosphere, of carrying power in the blood, of lung capacity, or interference with the circulation of the blood. The two factors which relate especially to diminished amounts of oxygen in the atmosphere are bad ventilation and altitude. The main effect of bad

ventilation, especially where there are a number of people in the room, is to increase the humidity. Anything that interferes with the general circulation of the blood, such as heart disease, tight clothing or the condition of the body, causes fatigue. The third great cause of fatigue is poisoning by accumulated waste in the muscles or poisoning by toxic substances.

Importance of Personal Hygiene

With disease so easily acquired from soiled hands, workers should have facilities for washing after going to the toilet. The mouth, too, is a harbor for diseasee germs and proper attention should be given to mouth cleanliness.

Much has been done in the installation of basins and showers and in the erection of dry-houses. In many places these have had the widest use, a large percentage of the employes bathing daily. Here again we cannot adequately estimate the good derived. But we do know that such facilities enhance one's self-respect and the respect of others. Shower baths affect the circulation of the blood, not only in the skin but in the whole body. Cold showers increase capacity for muscular work.

The cooling of work-places in summer is now being considered in many plants, and much is being done to make heated work places more comfortable, thus preventing heat stroke.

Ventilation Systems Improved

Thirty years ago, according to English statistics, nearly all who breathed dust from grinding steel and stone, died sooner or later from tuberculosis. Such dust has been entirely eliminated from certain mills in the industry. Air conditions have been much improved by the elimination of hydrocarbon series and other gases produced by open fires when combustion is incomplete.

Social and Religious Labor Factors

BY E. E. BACH

THE administration of industrial organization today embraces more than the cost of production and selling prices. Competition is deeper seated than mechanical devices, overhead charges and a shrewd manipulation of the markets. Despite latest equipment and a most efficient organization it is evident that capacity production will be an unknown quantity until the workman is considered as a producer, in relation to his home, as he is now considered in relation to industry. His attitude toward his work each morning is determined, to a large degree by his home environment. Whether this attitude obtains through the day depends upon whether or not the corporation which employs him differentiates between the mechanical factor and the human factor in industry.

To be more specific, sociological work should influence the life of a workman in such a manner as to establish a co-operative interest in his work, foster within him a spirit of contentment in his home, lead him to so employ his leisure time that he will not lower his efficiency as a workman, destroy his domestic happiness, or endanger his standing in the community as a citizen.

Any effort attempted must be non-sectarian, institutional and of such importance as to command the respect of the community.

It is the purpose of this paper to throw as much light upon this subject from the practical side as is possible. We all know of experiments here and there over the country, where the human factor in industry has been given consideration, but in order to be more specific it would seem permissible to cite the work attempted by the Ellsworth Colleries Co. at Ellsworth and Cokeburg, Pa., in the heart of the great Pittsburgh coal district. The combined population of the two towns is about 5000 people; the employes number between 2200 and 2500 and the school children number 1200. The company has always maintained a standardized style of architecture; the houses are electrically lighted and comfortable. Work is plentiful, the daily production being about 9000 tons of coal and 1000 tons of coke. The Protestants and Catholics each support a pastor, and worship in beautifully designed edifices. No drinking club, licensed saloon or "speak-easy" can be found in either town. With 163 Slovak families, 93 Russian, 79 American and 69 Italian, as well as representatives of almost every other race represented in the remainder, the problem was a typical one in industry at the present time.

It may be stated, fundamentally, that it is quite impossible to work out any scheme of helpfulness on the part of the employer unless the employe himself sees the need of it and feels that he is really the projector of the plan. There is no use in starting a machine-made organization with the idea of forcing it upon the men. It is far better to plant the ideas of betterment in the minds of the employes and await development, although this may be a slow process.

An opportunity is given employed girls to train themselves in the science of home making. This work has been made as practical in character as is possible. These classes have been composed mostly of the daughters of non-English-speaking parents. It is necessary to impress upon them the American methods of cooking and approved sanitary household practices. Lessons in the packing of dinner pails and luncheons were included in the course. Sanitary conditions in the homes, the "open window" in the bed room, and the inadvisability of "herding" a number of boarders in a home, have all formed a part of the necessary instruction.

Classes for adult foreign workmen have been conducted for the past five years for the purpose of giving them instruction in English in order that they might be able to understand the directions given them while at work.

The problem of just how far a corporation should go in assuming leadership in the matter of community athletics has been one of wide speculation. At first, it was thought best for the company to purchase the uniforms and all materials used, with the result that the participants felt no responsibility, and the season closed with differences between them and a large deficit to be paid by the company. A later plan adopted was that of encouraging athletics in every way possible, but having those interested assume all responsibility, even financially, and as a consequence the results have been more satisfactory.

It is a well known fact that in every man's life there are three dominating factors: namely, his home, his occupation, and his leisure time. It is an accepted fact that the manner in which an individual spends his leisure time determines his habits, his efficiency at his work, and his attitude toward his home. He can be more easily approached, he can be more easily influenced, and he will give his most hearty support to that which will afford him the greatest pleasure during leisure moments.

Rigid Specifications Bar Munitions

Low Phosphorus Limit Required by Government in Acid Castings Impossible to be Met on Quantity Basis Demanded Because of Limited Supply of Raw Material Say Manufacturers—Pig Iron Short

WASHINGTON, Feb. 5.—Inability to meet the rigid specifications of the ordnance department, particularly as relating to the maximum phosphorus limit, is delaying the placing of contracts for thousands of tons of steel castings and manufacturers are demanding that the government make a slight concession in its mandate that phosphorus should not exceed 0.05 per cent. This request it is pointed out, is not prompted by the inability of producers to meet this requirement, since it is representative of their practice in normal times. However, operating under the restraint of the present disjointed conditions, they say it is almost impossible for them to secure the necessary raw materials to meet specifications so rigidly drawn.

The foundries affected are those operating acid-lined open-hearth steel furnaces and side-blow converters. The bulk of the tonnage of steel castings that is to be machined is made from acid steel and this metal also is used almost exclusively for medium and small work. Basic steel, on the other hand, enters largely into railroad work, although castings for locomotives and tenders largely are acid.

Low Phosphorus Iron Short

A pronounced shortage in the supply of low phosphorus pig iron and scrap has brought about the present situation and since there is no immediate prospect of its increase, the demand for a less rigid limit on phosphorus content has been made to the ordnance department. Within the past three years the low-phosphorus pig iron producing capacity has been increased 80,000 to 100,000 tons annually by the Delaware River Steel Co., Chester, Pa., and the Thomas Furnace Co., Milwaukee. However, this tonnage, representing the most notable addition to the low-phosphorus pig iron production of the country in a decade, has not kept pace with the growth of consumptive needs. The greater part of the new steel foundry capacity that has become available since the beginning of the war, in the summer of 1914, is acid and many of the electric furnaces installed are drawing upon the limited supply of low phosphorus pig and scrap.

From Jan. 1, 1914, to Dec. 3, 1916. the production of low-phosphorus pig iron increased nearly 200,000 tons. The output for 1914 was 306,569 tons, as compared with 501,213 tons in 1916. Unfortunately, figures for 1917 have not yet been compiled, but it is doubtful if they will show much of a gain over those of the previous year. The actual gain in low-phosphorus pig iron production for 1914 to 1916 was 194,644 tons. During this same period the production of acid and converter steel castings increased 377,673 tons, or nearly twice the gain in the low-phosphorus pig iron output. Steel casting manufacturers present these facts as their best argument for more lenient phosphorus limits, and it seems almost inevitable that their demands must be met if the government is going to obtain the large tonnage of steel castings so essential to the speedy prosecution of its war program.

In 1914 the production of steel castings by the acid open-hearth process was only 270,173 tons and during that year 65,882 tons of converter steel were poured, a total of 336,055. In 1916 the acid steel output of open-hearth foundries was 570,937 tons and that of side-blow converter plants, 142,791 tons, or a total of 713,728 tons. It is reasonably certain that the production of the acid steel casting plants in 1917 was greater than that of the previous year and with low-phosphorus pig iron output practically stationary, the cause for the present acute shortage of raw material for acid steel castings readily becomes apparent. In addition to the foregoing, the demand for low-phosphorus melting stock for electric furnaces has increased tremendously. In 1914 only 8551 tons of electric steel castings were produced as compared with 42,870 tons in 1916. Last year the electric steel casting output made a tremendous gain owing to the large number of furnaces installed, although the figures have not yet been compiled. Electric furnaces, of course, may use basic pig, high phosphorus scrap or bessemer or open-hearth metal and they are not so restricted in their choice of raw materials as the acid open-hearth and the converter steel foundries.

In the figures giving the annual production of low-phosphorus pig iron, that made from copper-bearing ore is included, thereby further restricting the supply of copper-free, low-phosphorus pig iron for acid steel castings for ordnance purposes. The low phosphorus scrap tonnage also is limited owing to the increased use of home scrap by the mills due to the general pig iron shortage. Latterly, the supply of this material has been cut off almost entirely by the car shortage and other transportation difficulties. In the readjustment of pig iron prices, the biggest reductions were made in low-phosphorus pig iron and it is the prevailing opinion that if the government price had not been made, it would now be quoted at $200 per ton.

Ordnance experts contend that the maintenance of low-phosphorus limits are absolutely essential owing to the low factor of safety on all parts entering into the construction of field implements of war. These must be constructed as light as possible and some sections have a safety factor as low as one, which must be contrasted with factors of safety of 5 and 10 to 1 in industrial operations.

Owing to the country's limited low-phosphorus bearing ore resources, supplying the needs of the acid steel casting plants it is apparent will become increasingly difficult. The one solution to the problem that will afford immediate relief is that sugested by them say the steel casting manufacturers. It provides for raising the phosphorus limit on government specifications. If greater leniency is allowed on ordnance work, it is believed that industrial users will fall into line and the proportion of low-phosphorus pig iron in the charges may be slightly reduced thereby conserving the limited supply to this extent.

Saving Tin and Ammonia

Washington, Feb. 5.—The food administration, in a letter to Congressman Sydney Anderson, requests further legal power to make enforcements for the conservation of tin and ammonia, among other things. Administrator Hoover would like authority to force use of glass, paper and other containers in place of tin in certain food, toilet and other commodities. He also seeks power to regulate the use of ammonia. His letter says a shortage of 60,000,000 pounds a year is caused by consumption of 150,000,000 pounds annually by the army and navy for munition purposes and of 40,000,000 in cold storage warehouses. Last year the production reached only 130,000,000 pounds.

Control Over Exports is Tightened

War Trade Board Formulates New System for Issuing of Licenses to Ship Abroad—Data Required Are Very Comprehensive—Special Form Required for Tin Plate—Regulations for Iron and Steel

WASHINGTON, Feb. 5.—Adjustment of the operations of the war trade board's export bureau to conform with the customs regulations and to harmonize both with the trading-with-the-enemy and the espionage acts, has led to establishment of a new system in the matter of applying for export license. New forms have been made effective by the war trade board, under agreement with the customs bureau, the treasury department, and the department of commerce.

Complete Data Required

All applications for export license, regardless of the character of the commodity, must be made on Form X. On this form must be given the names of the applicant of the consignor, and of the consignee; the name of the purchaser abroad, of the person to whom the license is to be sent, and, if the articles for which the license is sought is to be re-exported the name of the person to whom it will be consigned. This form also requires full description and specific name of the product to be exported; the number and kind of packages, whether crate, bag, barrel, box, case, etc., the net weight, and the value. In addition, the proposed routing with the name, if possible, of the railroad, steamship line or vessel must be set forth, as well as the flag under which the vessel is registered, as Norwegian, Spanish, Japanese, etc.

Application must be made for each commodity. Failure on the part of the applicant to take reasonable precaution as to the distribution of goods, or the granting of an export license based upon the statements contained in this application will not relieve the consignor from any responsibility to which he may be liable.

The date the goods will be ready for shipment and the date of the contract must be given. In case the goods have to be specially manufactured, applicants are required to send in their applications before starting work. In all cases applications are to be made two weeks or earlier in advance of the proposed date of ocean shipment. Licenses ordinarily are good for 60 days, but in cases of special manufacture, will be made for a longer period. If licenses expire before use, they must be extended and application made for the extension on proper forms.

Practically all iron and steel products and articles produced in allied industries, which are affected by the proclamations of the President and the rulings of the war trade board, cannot have license for export unless the application on Form X is accompanied by Form X-2, which must be pasted on the back of Form X. This supplementary form must state whether the goods are for the actual needs of the United States and its allies; whether they contribute directly to the war needs; whether they are urgently needed abroad, in which case affidavit from the government of the country of destination is essential.

Special instructions on Form X-2 require, in the case of graphite electrodes, a statement whether they are to be used for electrometallurgical work, and if so, the exact nature of the steel or other products to be manufactured and in what country the steel or other products will be consumed. As to ferromanganese and other ferroalloys, it is imperative that evidence be furnished showing that the article mentioned is to be used for essential munition purposes of the allies. If coal or coke is to be exported, the number of tons already under license, which have not been shipped to the same consignee, the points of origin, the name of the steamship line if it is to be used for bunkering purposes, and whether any other fuel may be used must be stated.

Special Form for Tin Plate

In the case of tin plate and goods containing tin, Form X-4 must be pasted on the back of Form X. This supplementary form must show the name of the tin plate manufacturer, from whom the tin plate was purchased, the date of purchase or contract of purchase, where the plate is at the time application is made, full description of the plate, such as size, weight, number of sheets per package, number of packages, the equivalent of base boxes, and the total weight, net, in pounds; what the plate is to be used for, if for food containers the nature of the food and the country in which it is to be consumed; details of the contract and a guarantee that the goods of which license is sought will be used as stated and that the receipt of the shipment by the consignee will not release from stock any similar material.

Form X-1 applies to foodstuffs, Form X-3 to leather or hides, and Form X-5 for articles containing wool, etc. Shippers' export declaration, customs catalog, No. 7525, must be filed with the collector of customs at the port from which the goods are to be shipped before clearance will be granted. This declaration must be correct. From it the export statistics are compiled.

When the exporter's application is for direct trading with an "enemy" or an "ally of enemy" or any one believed to be either, Form ET-6 must be attached to Form X. This form must show the proposed method by which payment is to be made, with the names of banks and agencies involved and the reason why license should be granted. All documents which the applicant desires to exhibit in connection with the application must be submitted with the latter.

Transcontinental Iron and Steel Rates Raised

Washington, Feb. 5.—Decision of the interstate commerce commission on transcontinental commodity rates last week increased from 32.5 cents to 47.5 cents per 100 pounds the export rate on iron and steel articles from Chicago and other eastern points to Pacific coast ports for export to Asiatic, Australian and Latin American ports. The rate on anchor rods, angles, etc., is increased from 40 cents to 55 cents, cast iron pipe connections 45 to 60 cents, railway equipment 50 to 65 cents, and machinery 55 to 75 cents. From fewer points in the same territory the rate, Chicago basis, on agricultural implements is established at $1.25. On road-making machinery and implements the rate is increased from $1 to $1.25; on dredging machinery $1 to $1.25, and on vehicles $1.10 to $1.25.

Authority was given carriers to file increased carload commodity rates from eastern points to Pacific coast and intermediate destinations and was refused on application to cancel all less than carload commodity rates from and to those points.

WAR TRADE BOARD
BUREAU OF EXPORTS

FORM X

APPLICATION FOR EXPORT LICENSE

THIS FORM IS NOT TO BE USED IN APPLYING FOR EXPORT LICENSES TO SHIP ARTICLES TO ANY COUNTRY, IN ACCORDANCE WITH INSTRUCTIONS CONTAINED ON THE BACK HEREOF, WHICH MUST BE CAREFULLY FOLLOWED. ANSWERS MUST BE TYPEWRITTEN OR WRITTEN LEGIBLY, OR WITH RUBBER STAMPS.

App. No. .....
Disposition .....
Date .....
Expiration date .....
Drawn by .....
Checked by .....

(SPACE ABOVE THIS LINE FOR OFFICIAL USE ONLY.)

WAR TRADE BOARD,
BUREAU OF EXPORTS,
Washington, D. C.

I / We hereby apply for a license to export the merchandise named herein.

(1) Date ..... (2) Applicant's Reference No. .....

(3) Applicant (signed) ..... Nationality .....
By ..... Year established .....
Address ..... Nature of business .....
Acting as .....
(State whether principal or acting as agent, broker, or factor in this transaction, and if so, give name and address of the parties or firm for whom so acting.)

(4) Consignee's Name .....
Address ..... Nationality .....
Nature of business ..... Year established .....
Acting as .....
(State whether principal or acting as agent, broker, or factor in this transaction, and if so, give name and address of the parties or firm for whom so acting.)

(5) Number and kind of packages, e. g., 10 crates, 40 drums, 30 bags, 50 barrels, etc.	(6) Commodity. Describe articles fully, so consular ports, prohibited entries, classification, etc., purchasers, city, goods, etc., of trade cannot will not be consigned.	(7) Quantity. (Net weight must be stated in standard units, such as lbs., tons of 2,240 lbs., gallons, yards, board ft., bushels, etc.	For official use only	(8) Value. In whole dollars only, at time and place of shipment.

(9) Goods will be ready for shipment ..... (10) Date of contract .....

(11) Consignee's ..... Name .....
Address ..... Nationality .....
Nature of business ..... Year established .....
Acting as .....
(State whether principal or acting as agent, broker, or factor in this transaction, and if so, give name and address of the parties or firm for whom so acting.)

(12) Purchaser abroad Name .....
Address ..... Nationality .....
Nature of business ..... Year established .....
Acting as .....
(State whether principal or acting as agent, broker, or factor in this transaction, and if so, give name and address of the parties or firm for whom so acting.)

(13) License to be sent to— Name .....
Address .....

(14) State whether or not goods are to be transported, and if so, to whom. Goods are ..... to be transported to
Name .....
Address ..... Nationality .....
Nature of business ..... Year established .....
Acting as .....
(State whether principal or acting as agent, broker, or factor in this transaction, and if so, give name and address of the person or firm for whom so acting.)

(15) Indicate proposed routing, giving, if possible, name of railroad and name of steamship line and/or vessel .....

(16) Under what flag is vessel registered? .....
(17) Has any other application been filed for license to cover this shipment? If so, state by whom .....

(18) How long have you been doing business with the Consignee or the person for whom he is acting? .....

THE ABOVE QUESTIONS MUST BE ANSWERED IN ALL CASES. SEE INSTRUCTIONS ON REVERSE SIDE HEREOF.
Forms WTB 10.

FORM X-2
Dec. 20, 1917.

SUPPLEMENTAL INFORMATION SHEET.

TO BE USED IN APPLYING FOR LICENSE TO EXPORT CERTAIN ARTICLES OR COMMODITIES LIST AS NOTED IN THE "JOURNAL OF THE WAR TRADE BOARD." NOTE ALSO INSTRUCTIONS ON REVERSE SIDE HEREOF FOR ADDITIONAL QUESTIONS TO BE ANSWERED FOR CERTAIN COMMODITIES. FILL OUT COMPLETELY AND PASTE SECURELY ON BACK OF APPLICATION FORM X, WHICH ALSO SHOULD BE FULLY FILLED OUT IN ACCORDANCE WITH INSTRUCTIONS STATED THEREON.

1. State whether goods are—
(a) For the actual war needs of the United States or of the nations at war with Germany or her allies. Answer .....
and/or (b) To contribute directly to such war needs. Answer .....
and/or (c) Necessary to the immediate production of important commodities required by the United States. Answer .....
and/or (d) Urgently required abroad, the application for which is supported by the Government of the country of destination. Answer .....
and/or (e) Such, that shipment of same, in limited quantities, will not seriously impair the resources of the United States. Answer .....
and/or (f) Necessary for purely medicinal or pharmaceutical purposes. Answer .....
2. State name and address of person or firm by whom the material or stores will be used, and whether engaged on Government work, and if so, of what kind and to what extent, and for what Government.

3. State the specific purpose for which the material is required, and describe the urgency of the requirement.

4. How long will the supply now asked for last the consignee?
5. What is the normal consumption by the consignee for the period mentioned in your reply to No. 4?
6. What stocks, if any, of the goods asked for do you now hold?
7. What stocks, if any, of the goods asked for does consignee now hold?
8. Has the consignee any stores or material of the description referred to in this application now under indent order or supply from you? If so, what is the quantity?
9. Give the name and address of United States manufacturer of the goods referred to in this application.
10. Is material required for immediate consumption or to replenish depleted stocks?

RECOMMENDATION OF REPRESENTATIVE OF THE GOVERNMENT OF DESTINATION.
(Obtaining this indorsement will facilitate the consideration of application.)

I hereby support this application and recommend to the War Trade Board that license be granted, as the goods applied for are properly included in Class ..... as stated by the applicant above.

SEE SPECIAL INSTRUCTIONS FOR DIFFERENT COMMODITIES ON THE BACK HEREOF.

NOTE.—If there is not sufficient space above to describe the material facts in detail, or to answer specific questions asked on the reverse side hereof, use space below for this purpose.

(Signed) .....
By .....
Date ..... (Applicant's address.)

FORM X-4

SUPPLEMENTAL INFORMATION SHEET
FOR TIN PLATE OR ARTICLES CONTAINING TIN.

Dec. 20, 1917.

TO BE USED IN APPLYING FOR LICENSE TO EXPORT TIN PLATE AND GOODS CONTAINING TIN, OTHER THAN TIN PLATE. FILL OUT COMPLETELY AND PASTE SECURELY ON BACK OF APPLICATION FORM X, WHICH ALSO SHOULD BE FULLY FILLED OUT IN ACCORDANCE WITH INSTRUCTIONS THEREON.

TIN PLATE.

1. Name of manufacturer of tin plate .....
2. I / We purchased the tin plate from ..... (Name.) ..... (Address.)
3. Date of purchase ....., or contract for purchase .....
4. The plate is at present at .....
(Give present position of plate, i. e., at factory or at railroad forward by bill of lading (date) .....)
5. Full description of the plate:

Size of plate.	Gross weight.	Number of sheets per package.	Number of packages.	Equivalent of base boxes.	Total net weight in pounds.

6. The plate is to be used for .....
(Give full details.)
7. If it is for food containers, state in detail the exact nature of the food to be packed and the country in which the food will be consumed .....
8. The goods in the production of which the tin plate is to be used are contracted for by .....
(Give details of ordering.)
9. We have a firm order for the tin plate from .....
(Give name and country.)
under date of .....

GOODS CONTAINING TIN, OTHER THAN TIN PLATE.

1. Name of manufacturer of the goods .....
2. I / We purchased the goods from ..... (Name.) ..... (Address.)
3. Date of purchase ....., or contract for purchase .....
4. The goods are at present at .....
(Give present position of goods.)
5. Full description of goods .....
(Give details, designation, and total net weight in pounds.)

	Total net weight in pounds.	Percentage of tin content.

6. The goods are to be used for .....
(Give full details.)
7. I / We have a firm order for the goods from .....
(Give name and country.)
under date of .....

STATEMENT TO BE INDORSED UPON GOODS ABOVE FORMS ARE USED.

I / We guarantee but when the goods referred to reach their destination their distribution will be so controlled that they will not be used for any other purposes whatever than those stated above; and that their receipt by the consignee or ultimate consignee will not be made the occasion for setting free for export, or for other uses than those stated, other goods of the same sort which the consignee or ultimate consumer may already have in stock.

(Signed) .....
By .....
Date ..... (Applicant's address.)

NOTE.—If there is not sufficient space above to describe the material facts in detail, use space below for this purpose.

Form WTB 10. APPLICATION FORM ET-6.

WAR TRADE BOARD
BUREAU OF ENEMY TRADE
WASHINGTON

This form is to be used whenever the exportation of the article or merchandise is contained under Title VII of the Espionage Act and involves trading directly or indirectly with or on behalf of an "enemy" or "ally of enemy," or with or on behalf of a person acting on behalf of or for the benefit of an "enemy" or "ally of enemy," unless a general license so to trade has been obtained.

FILL OUT AND ATTACH TO EXPORT APPLICATION FORM X.

App. No. .....
Disposition .....
Date .....
Drawn by .....
Checked by .....
License No. .....
Expiration date .....

(SPACE ABOVE THIS LINE FOR OFFICIAL USE ONLY.)

Instructions on the back of this sheet should be carefully read before this application is filled in. Answers must be written legibly or typewritten, if possible.

EXPORT APPLICATION FOR LICENSE TO TRADE WITH AN "ENEMY" OR "ALLY OF ENEMY" BY EXPORTATION OF AN ARTICLE RESTRICTED UNDER TITLE VII OF THE ESPIONAGE ACT.

Applicant's Reference No. ..... *Date* .....

WAR TRADE BOARD,
BUREAU OF ENEMY TRADE,
Washington, D. C.

I / We hereby apply for a license to trade with or on behalf of such "enemy" or "ally of enemy," or person acting on behalf of or for the benefit of an "enemy" or "ally of enemy," as is named below, by the exportation of the merchandise described in Form X attached hereto.

1. Consignee:
Name ..... Address .....
Nationality ..... Nature of business .....

2. Give accompanying particulars as to any person interested in this exportation who there is reasonable cause to believe is an "enemy" or "ally of enemy," or person acting on behalf of, or for the benefit of, an "enemy" or "ally of enemy":
Name ..... Address .....
Nationality ..... Nature of business .....

3. Relation of such person to the proposed transaction.

4. State the facts upon which applicant bases his knowledge, belief, or reasonable cause to believe that such person is an "enemy" or "ally of enemy," or is acting on behalf of, or for the benefit of, an "enemy" or "ally of enemy."

5. State fully the proposed method by which payment will be made, giving names of banks or other agencies through which it is proposed to deal.

6. State any reasons peculiar to this particular case why a license should be granted.

I / We hereby declare that to the best of my / our knowledge and belief, the foregoing particulars are correctly stated, and I / we undertake that if this license is granted it will be used solely for the purposes stated in this application.

(Signed) .....
By .....
Status of signatory .....

License to be sent to .....
Address .....

VARIOUS FORMS USED IN NEW EXPORT LICENSING SYSTEM PUT IN EFFECT BY WAR TRADE BOARD

Iron and Steel Financial News

Up-to-the-Minute Fact and Comment Collected and Sifted For Busy Readers

Steel Company Earnings Are Increased

EARNINGS of the Inland Steel Co., Chicago, for 1917, total $21,240,783, after deducting for maintenance and repairs, or practically twice those for 1916, which were of $11,241,046. After setting aside $8,500,000 for income and war excess profits taxes, with an allowance of $1,457,866 for depreciation, $10,535,000 remain for the present capital stock of $25,000,000, equivalent to 42.12 per cent. Earnings per share in 1916 amounted to over 100 per cent on $10,000,000 capital stock. Dividends at the rate of 8 per cent were paid during 1917, leaving a surplus of $8,535,246, making a total surplus of $9,894,656, as compared with $16,359,409, the surplus at the end of 1916, which was largely absorbed when the capital stock was increased by approximately $15,000,000. The income account for the past year, as compared with 1916, is as follows:

	1917	1916
Net earnings after replacements and maintenance, etc.	$21,240,783	$11,241,046
Plant depreciation	1,457,866	400,000
Mineral exhaustion	311,300	139,241
Bond interest	436,549	375,450
Total deductions	2,205,716	914,691
Net profits for year	19,035,066	10,450,786
Federal taxes	8,500,000	.....
Dividends paid	1,999,820	799,908
Surplus for year	8,535,246	9,650,878
Previous surplus	1,359,410	6,708,531
Total surplus	9,894,656	16,359,409

Assets were augmented in 1917 by the addition of $8,125,791 to the item of lands, plants, etc., as shown in the balance sheet inventories were increased from $4,848,586 to $9,720,002 since 1916, and Liberty bonds and treasury certificates totaling $7,500,000 are held by the company. The total assets for 1917 are $57,413,890 as against $36,252,599 in 1916.

How the War Tax on Steel Freights is Charged

THE IRON TRADE REVIEW, on page 230 in the issue of Jan. 17, 1918, referred erroneously to methods pursued by the leading steel mills in disposing of the federal war tax on freight charges. The situation with regard to the war tax on freight rate charges is as follows: Where the steel has been sold on a mill or Pittsburgh basis, the custom of the mills universally is to leave the war tax to be paid by the buyer. Where the steel has been sold on a delivered basis, however, the practice varies in accordance with the terms of the original contract of sale. In transactions where the sale is made on a delivered basis and where the contract states that the freight is "allowed", a majority of the mills charge the war tax to the customer on the ground that the war tax cannot be regarded as a part of the freight rate. Where sales have been made on a straight delivered basis, the general custom is for the mills to pay the tax.

Earnings of Thomas Iron Co. Grow Greatly

For its sixty-fourth year, net earnings for the Thomas Iron Co., Hokendauqua, Pa., were $319,624, for the fiscal year ended Dec. 31, 1917, as compared with $72,512 for the fiscal year ended June 30, 1916. At a meeting held in September last, the stockholders voted to change the ending of the fiscal year from June 30 to Dec. 31. Dividends declared during the year totalled $124,996, making the surplus $194,628. Total surplus now is $2,233,554. Income and excess profits taxes set aside totalled $58,210, and $126,045 was charged to depreciation and depletion. Other deductions are $131,535, to restore depleted extraordinary repairs, renewals and development reserves as of Jan. 1, 1917; $250,684 for extraordinary repairs, renewals and development accounts, and expended in 1917, and $110,131 for obsolete equipment. Gross revenue amounted to $3,785,984, and there is an absence of the item of loss from sale of product in 1917, which in 1916 amounted to $99,372 and in 1915 to $122,858.

The company's cash position was improved nearly three-fold in 1917, with a total of $206,822, as compared with $76,968 in 1916. Total current assets, including $725,326 total cash and receivables, and an inventory of $814,169, amount to $1,539,496, against total current assets of $997,205 in the preceding year.

In his statement to the stockholders, President W. A. Barrows Jr., said that curtailed fuel supply, general labor conditions and repairs to furnaces restricted production and at the Richard mine only 53,175 tons of ore were produced in 1917.

Bethlehem Earns Less on Government Orders

Much smaller profits are being realized by the Bethlehem Steel Corp. from its work for the United States government than was the case when that producer was filling munition contracts for foreign powers, according to the annual report covering 1917. This statement shows that last year's net profits were equivalent to but 9.25 per cent on gross sales as against 20.16 per cent in 1916. On gross sales of $296,000,000 as shown by the accompanying table, $52,651,431 was earned after deductions for taxes, repairs and maintenance. In 1916 a net of $61,717,309 was earned on sales aggregating $216,284,555. Net profits last year, after all charges were deducted before dividends, amounted to $27,320,736 as against $43,593,968 in 1916.

	1917	1916
Total net earnings after taxes, etc.	$52,651,431	$61,717,309
Less int. on subsid. bonds and notes	7,419,053	3,772,555
	$45,232,378	$57,944,754
Deprec. and depletion	17,911,640	14,350,785
Net income	$27,320,738	$43,593,969
Gross sales	$296,000,000	$216,284,555
Percentage net income on gross sales	9.25%	20.16%
Orders on hand	450,500,000	193,374,248

Charles M. Schwab, chairman, recently stated that the company had not published and would not do so, the exact amount of federal and war income and excess profits taxes for the period of 1917, since practically all business was furnished by the government.

The value of orders on hand Dec.

31, 1917, was estimated at $450,500,000, against $193,374,248 in 1916, and $175,432,000 the year previous. As indicative of the way the war entered into Bethlehem's operations, the unfilled orders on hand Dec. 31, 1914, totaled $46,513,000 and a year before that they were only about half that or $24,865,000. In 1912, the total was $29,282,000 and in 1911, $15,885,000. After dividends on 7 per cent preferred stock, the balance available for $59,448,000 common stock outstanding amounted to $44.20 per share.

Buys Furnace

At Lowellville and Sharon Steel Hoop Plans Extensions

The Sharon Steel Hoop Co., Sharon, Pa., has acquired the blast furnace of the Ohio Iron & Steel Co. at Lowellville, O., with 200 surrounding acres, 130 of which are available for industrial uses. Extensions are contemplated, including by-product coke ovens, a blast furnace, open-hearth mixer, finishing mills and the development of a model town on an adjoining 60-acre site, which will involve a large expenditure. The consideration is given as $3,000,000 and it is understood the Sharon company will increase its capital from $10,000,000 to $15,000,000 to cover the payment, since the Ohio Iron & Steel did not desire cash. Arrangements are being made by S. P. Ker, president of the Sharon Steel Hoop Co., to reside in Youngstown, and it is expected that the corporation's headquarters will be established there as well. Robert Bentley, president of the Ohio Iron & Steel Co., who organized it 39 years ago, will be given a place on the Sharon Steel Hoop Co.'s board of directors.

At the Youngstown plant, the Sharon Steel Hoop Co. has four open-hearth furnaces, and is building two more to give it a daily capacity of 900 tons. At the Sharon plant, its daily capacity is about 500 tons. Finishing capacity of the corporation consists of nine sheet mills with an annual capacity of about 75,000 tons, a 72-inch plate mill at the Haselton, O., plant and a 40-inch universal plate mill, a three-high blooming mill and a Morgan continuous sheet bar mill under construction at the Lowellville plant. It is expected that finishing capacity ultimately will be assembled at Lowellville, leaving the Haselton property to the subsidiary, the Youngstown Pressed Steel Products Co.

Shipbuilders Increased

With a total of $6,960,000 capitalization for shipbuilding companies incorporated in December, the total for 1917 is brought to $271,503,000. This breaks all records. The peak was reached in June, when the aggregate capital was $84,025,000. May was likewise one of the large months, with $47,490,000. May and June had nearly half the year's total. Other months' figures follow: January, $2,475,000; February, $30,525,000; March, $12,975,000; April, $29,395,000; July, $19,020,000; August, $19,038,000; September, $5,100,000; October $9,650,000; and November, $4,850,000.

Financial Crop Ends

The Eddy Machinery Co., Providence, R. I., has purchased the Winthrop Mfg. Co., Attleboro, Mass., of its owners, William J. Doyle, Attleboro, and Thomas McGrath, Providence.

* * *

Locomotive sales by the Baldwin Locomotive Works, Philadelphia, for the year ended Dec. 31, 1917, aggregated nearly $100,000,000. Orders are carried over which will represent practically another year's business.

* * *

The John Swaine Iron Works Co., Inc., Springfield, Mass., has been petitioned into bankruptcy in Boston, by five creditors. The company was incorporated in 1912, with $15,000 capital, John W. Swaine being president and John Swaine, treasurer.

* * *

The Goldschmidt Detinning Co. and the Goldschmidt Thermit Co. have been amalgamated and hereafter will be known as the Metal & Thermit Corp. The new company will continue the business of the old companies and the only change will be in the dropping of the old corporate names. Headquarters will be continued at 120 Broadway.

* * *

One-half of $250,000 of its new issue of 7 per cent preferred stock is being offered by the John Lauson Mfg. Co., New Holstein, Wis., gas engines, tractors and farm machinery. By this sale, the company's normal output of 4000 tractors annually will be doubled. The capital stock was recently increased from $500,000 to $1,000,000.

* * *

The Stanley Rule & Level Co., New Britain, Conn., elected the following officers at the annual stockholders' meeting, Jan. 22: A. W. Stanley, president; R. N. Peck, vice president; C. B. Stanley, secretary and treasurer; C. W. Nichols, assistant secretary; A. W. Stanley, C. B. Stanley, H. S. Walter, Meigs H. Whaples, George P. Hart, W. J. P. Moore, F. G. Platt, J. M. Burdick and R. N. Peck, directors.

* * *

The Hopkins & Allen Machine Gun Co., Boston, was recently petitioned into bankruptcy in the United States district court in that city by the Baush Machine Tool Co., Springfield, Mass., and other creditors. This company is a subsidiary of the Hopkins & Allen Arms Co., Norwich, Conn., a $3,000,000 corporation, which was recently sold by the receivers to the Belgium government under a foreclosure of a mortgage.

Short Supply

Of Ammonium Sulphate Precludes Effect from License System

New York, Feb. 2.—Business in sulphate of ammonia now is being conducted in accordance with the system recently outlined by the food administration. All sellers and buyers of the primary product, except those using it exclusively for manufacture into secondary products, have been provided with government licenses. The application of the license system has not materially affected the market, due to the scarcity of the supply. Current contracts call for practically all of the sulphate of ammonia which normally would be produced up until May 1. Owing to the decreased production during the past few months, however, and to the quantities commandeered by the government, it is almost certain these contracts will take up practically the entire output to July 1. It is exceedingly difficult to squeeze out spot lots and sales therefore involve only an odd carload here and there. Prices on such business are ascending and the market on spot now may be quoted at $5.10 to $5.35 per 100 pounds at tidewater.

Sales of benzol during the past week were normal, involving a few hundred thousand gallons both for spot and contract. These were on the same price basis of recent weeks, 35 to 40 cents per gallon. Phenol is unchanged. Supplies are almost impossible to obtain due to the contract deliveries and the extent to which the decreased production is holding these up. Current business comprises only odd spot lots at 53 to 55 cents per pound. In solvent naphtha, the current volume of business is small. The market continues firm.

Coke Oven By-Products

Spot

Per Gallon at Producers Plant

Pure benzol	$0.35 to .40
Toluol (nominal)	1.70 to 1.80
Solvent naphtha	.18 to .22

Per Pound at Producers Plant

Phenol	$0.53 to .55

Per 100 Pounds at Seaboard

Sulhate of ammonia (nominal)	$5.10 to 5.35

Contract

Per Gallon at Producers Plant

Pure benzol	$0.35 to .40
Toluol	nominal
Solvent naphtha	.18 to .22

Per Pound at Producers Plant

Phenol nominal.

Per 100 Pounds at Seaboard

Sulphate of ammonia	nominal

Men of Machinery Trade

Personal News of a Business Character Regarding the Men of Affairs of the Industry

ALEXANDER C. BROWN, who was selected chairman of the crane committee of the war industries board a short time ago, is vice president and general manager of the Brown Hoisting Machinery Co., Cleveland. Mr. Brown is a grandson of the late Fayette Brown, who organized the company in 1880, and a son of the late Alexander E. Brown, who was vice president and general manager of the company for many years. He was born in Cleveland May 6, 1885. After graduating from Yale university with the degree of B. A., in 1907, he took a special course in mechanical engineering at Case School of Applied Science, Cleveland. In 1909 he entered the Brown Hoisting Machinery Co., working in different departments until 1911, when he was elected vice president of the company. Upon the resignation of Richard B. Sheridan, who left, in April, 1916, to take a position with the American International Corp., New York, Mr. Brown was chosen general manager.

C. M. Robertson has opened a sales office in Machinery Hall, Clinton and Washington streets, Chicago. He will represent the Colburn Machine Tool Co., Franklin, Pa., and other interests.

John C. Wilson was chosen president and treasurer, and Robert H. Schutz, vice president and secretary of the Smyth Mfg. Co., Hartford, Conn., at its annual meeting Jan. 28.

David F. Noble has taken a position with the David W. Wright Machinery & Equipment Co., Chicago. Mr. Noble formerly was associated with the E. L. Essley Machinery Co., Chicago.

Robert L. Arms has been made sales manager of the Monarch Machinery Co., 300 North Third street, Philadelphia. Mr. Arms formerly was in the sales department of Manning, Maxwell & Moore, Inc., and later with the Sherritt & Stoer Co., in a similar capacity.

E. L. Nolan has been named district representative of the Crown Die & Tool Co., Chicago, with headquarters in Cincinnati. C. J. Weller, who recently was appointed eastern representative, has opened offices in Newark, N. J.

C. E. Conkling, who has been associated with the Mesta Machine Co., Pittsburgh, has been commissioned a captain in the army and is attached to the steel production division of the ordnance bureau of the war department.

ALEXANDER C. BROWN

T. R. Burke, for many years Pacific coast representative of the Sloan Valve Co., Chicago, has been named assistant sales manager of the company. He will be succeeded by E. C. Whalen, who will have headquarters in the Wells-Fargo building, San Francisco.

J. H. Hammill, vice president and treasurer of the Strong-Scott Mfg. Co., Minneapolis, manufacturer of flour mill machinery, has joined the food administration as manager of the new mechanical department in connection with its milling division. The purpose of this division, which is located at 74 Broadway, New York, where Mr. Hammill will have his office, is to assist millers along technical lines in converting or setting up mills for grinding barley, rye and corn, and to assist in the movement for wheat saving in the United States.

Milton Rupert, who has been affiliated with the R. D. Nuttall Co., Pittsburgh, manufacturer of gears, pinions and trolleys, since 1893, was recently elected to the position of vice president and assistant treasurer, in charge of sales and manufacturing activities. During this almost a quarter-century connection, Mr. Rupert has held various important positions, and prior to his recent promotion he was assistant to the president as well as general manager.

Arthur J. Wallace, secretary and treasurer of the Economic Machinery Co., Worcester, Mass., has resigned to enter general war relief work. Edward B. Moor has succeeded Mr. Wallace as secretary and treasurer of the company. Leonard W. Howell, until recently in charge of the office, has been made sales manager. Daniel W. Gurnett, Boston, was elected president, and Herman Stake, Worcester, vice president and general manager at the annual meeting of the company recently.

William A. Carrell, formerly general superintendent of the motor plant of the International Harvester Corp.'s Milwaukee works, has accepted the position of chief engineer and works manager of the Erd Motor Co., Saginaw, Mich., manufacturer of kerosene tractor engines. Mr. Carrell at one time was general superintendent of the Beaver Mfg. Co., Milwaukee, and prior to that he was designing and production engineer of the Wisconsin Motor Mfg. Co., of that city.

R. S. Cooper, vice president of the Independent Pneumatic Tool Co., Chicago, who for many years was the manager of the company's New York branch office has assumed the duties of general sales manager in addition to those he already holds as vice president. Mr. Cooper has headquarters at the general offices of the company in the Thor building, Chicago. R. T. Scott, formerly Pittsburgh office manager, has been named manager of the New York branch office, with headquarters at 170 Broadway. H. F. Finney has been placed in charge of the Pittsburgh office.

Men of the Iron Trade

Personal News of a Business Character Regarding the Men of Affairs of the Industry

CAMERON C. SMITH, who on Jan. 15, was appointed major, ordnance reserve corps and was assigned to the production department, carriage division of the ordnance department of the United States army, with headquarters at Washington, D. C., was elected chairman of the board of directors of the Union Steel Casting Co., at its annual meeting Jan. 26. He served as president of the company for 18 years. Born in Clinton township, Butler county, Pa., April 2, 1861, Mr. Smith after receiving a business education, accepted a position as stenographer in the office of Wilson Walker & Co., Pittsburgh, iron and steel manufacturers. He remained there 10 years during which time the company was merged into Carnegie, Phipps & Co., and then into the Carnegie Steel Co. In 1893, he became affiliated with the Reliance Steel Casting Co., Pittsburgh but six years later withdrew to organize the Union Steel Casting Co., in that city. For one year his official title was secretary and general manager but in 1900 he was elected president. Other officers elected at the annual meeting of the company are: J. P. Allen, president, who formerly was vice president; S. H. Church, vice president; G. W. Eisenbeis, treasurer; W. C. Eichenlaub, secretary and J. B. Henry, general superintendent. The board of directors is made up of Messrs. Smith, Allen, Church, Eisenbeis and Henry and W. P. Potter.

M. H. Beary was recently elected secretary of the Bethlehem Motors Co., Allentown, Pa.

L. G. Kibbe was recently tendered a farewell banquet by department heads upon the occasion of his resignation as president of the Turner & Seymour Mfg. Co., Torrington, Conn.

Theodore E. Ferris recently resigned as chief ship designer for the Emergency Fleet corporation, according to an announcement by Chairman Hurley of the shipping board.

Harold Wesson, vice president and superintendent of the Smith & Wesson Associates, Springfield, Mass., maker of revolvers, has received a lieutenant's commission in the naval aviation division and will report for service in the near future.

S. S. French, vice president and general manager of the General Fireproofing Co., Youngstown, O., was recently elected a member of the board of directors.

H. H. Elmer becomes the New York representative of Frank Samuel, Philadelphia, dealer in iron and steel scrap and ore, to succeed H. L. Warner, who has joined the National army at Camp Upton.

George E. Price, who has been affiliated with the sales force in the

CAMERON C. SMITH

Pittsburgh office of the Youngstown Sheet & Tube Co., has been transferred to the Chicago office, with which he will be associated temporarily.

H. C. Hequemborg, formerly purchasing agent for the American Locomotive Co., Dunkirk, N. Y., has been appointed major in the ordnance reserve, under Adjutant General McCain at Washington.

Ben D. Christian and D. B. Craze now represent the Crocker-Wheeler Co., New York City, in the Cleveland district, with headquarters in the Guardian building. They succeed Howard Dingle and W. W. Clark.

Herbert A. Johnson, formerly general superintendent of the North & Judd Mfg. Co., New Britain, Conn., who resigned to receive a captain's commission in the ordnance department, was recently promoted to the rank of major.

George O. Hollenbaugh, formerly assistant superintendent of blast furnaces for the McKinney Steel Co., Cleveland, has been made superintendent to succeed Charles E. Ash, who recently resigned.

Charles D. Lehmkuhl, formerly of the Thomas-Detroit and Chalmers motor companies, has been made secretary and director of the Air-O-Flex Automobile Corp., Detroit, to succeed G. L. Nadel.

A. H. Preston, formerly general storekeeper for the Upson Nut Co., Cleveland, was promoted on Feb. 1 to the position of purchasing agent. He succeeds C. E. Hill, who has been transferred to the treasury department.

F. P. Welton, formerly with the Naugatuck Valley Crucible Co., Derby, Conn., has become affiliated with the Jonathan Bartley Crucible Co., Trenton, N. J., and will represent them in the sale of crucibles throughout New England and Canada.

W. C. Wright of the National Founders association addressed the Newark Foundrymen's association, Newark, N. J., Feb. 6, on methods of molding and the production of castings at minimum cost as reflected by practice at typical western plants.

A. E. Wells, superintendent of the bureau of mines' experiment station at Salt Lake City, has been assigned to the war industries board to assist in connection with sulphuric acid matters, since he has made a special study of that commodity.

Charles S. Bilyeu, who early in 1917 left Hildreth & Co., engineers, New York City, to become an inspecting engineer for Gulick-Henderson Co., New York, has been made assistant to Henry Gulick, the latter company's president.

R. T. McCloskey, formerly superintendent of the Leetsdale, Pa., plant of the Riter-Conley Mfg. Co., has been appointed superintendent of the Wheatland, Pa., plant of the Blaw-Knox Co., to succeed G. Morrison, resigned.

Steel Contracts

Practically Made an Open Price Basis Under Revision Clause

Chicago, Feb. 5.—Steel contracts now being made contain a clause subjecting prices to revision on all material shipped after March 31, in conformity with the government announcement made in December, when present prices were fixed for the first quarter. Quotations are also being made with a clause giving notice that the prices named are subject to this revision.

An important steel manufacturer includes the following clause in all its quotations: "The prices quoted for the materials named herein are subject to revision to a basis that may be fixed by the proper United States Government Agency, by agreement or otherwise, as the public or market price for such materials at the time of shipment, for any portion that may be unshipped as at March 31, 1918."

Contracts now being made contain the following clause, stating the same condition: "The prices to be paid by the purchaser for any of the materials named herein, which are shipped under this contract after March 31, 1918, shall be the price fixed by the proper United States Government Agency, by agreement or otherwise, as the public or market price for such materials at the time of shipment, instead of the price herein named."

Inasmuch as little material now being contracted will be delivered during the first quarter the effect of this provision is to make all contracts at an unknown price, subject to the government announcement at the end of the current quarter or any subsequent date before delivery is made. This provision applies to practically everything except standard steel rails, on which no price has been fixed.

Convention Date Decided

For its 1918 annual convention, the Association of Iron and Steel Electrical Engineers has selected Baltimore. It will be held Sept. 9-13. The Pittsburgh section will hold a meeting at the Hotel Chatham, Feb. 16. A paper on alternating current and direct current skip hoists will be presented by Mr. Lindquist, of the Otis Elevator Co. Officers for the ensuing year were elected at the 1917 annual meeting as follows: C. A. Menk, Carnegie Steel Co., Munhall, Pa., president; D. M. Petty, Bethlehem Steel Co., South Bethlehem, Pa., first vice president; B. W. Gilson, Carnegie Steel Co., Youngstown, O., second vice president; J. F. Kelly, National Tube Co., McKeesport, Pa., secretary, and James Farrington, La Belle Iron Works, Steubenville, O., treasurer. F. D. Egan, Pittsburgh Iron and Steel Foundries Co., Midland, Pa., served as president in 1917 and W. T. Snyder, National Tube Co., McKeesport, Pa., in 1916.

Chairmen of the respective committees for 1918 are as follows: W. T. Synder, National Tube Co., McKeesport, Pa., standardization committee; W. O. Oschman, Oliver Iron & Steel Co., Pittsburgh, power committee; A. H. Swartz, Westinghouse Electric & Mfg. Co., publicity and promotion, as well as convention committees; K. H. Cedarland, Duquesne Steel Works of the Carnegie Steel Co., Duquesne, Pa., electric furnace committee; J. F. Kelly, National Tube Co., McKeesport, Pa., membership committee; Walter Greenwood, Carnegie Steel Co., Youngstown, O., safety committee; B. W. Gilson, Carnegie Steel Co., Youngstown, O., educational committee; E. Friedlander, Carnegie Steel Co., Braddock, Pa., editing committee; W. C. Kennedy, Standard Seamless Tube Co., Ambridge, Pa., electrical development committee, and F. D. Egan, Pittsburgh Iron & Steel Foundries Co., Midland, Pa., finance committee.

Five years after the Association of Iron and Steel Electrical Engineers was organized in 1908 with James Farrington as president, the national safety council developed from one of its committees.

Obituaries

THOMAS FAWCUS, president of the Fawcus Machine Co., Pittsburgh, manufacturer of herringbone gears, died recently at Mercy hospital, Pittsburgh, aged 51, after an illness of about three weeks.

THOMAS FAWCUS

Mr. Fawcus was born in England, and came to this country in 1888 and located in Birmingham, Ala. Later he became connected with enterprises in Chattanooga, Tenn. Coming to Pittsburgh, he was associated in turn with the Westinghouse Electric & Mfg. Co., Anderson-Dupuy Co. and the R. D. Nuttall Co. In 1900 he organized the Fawcus Machine Co. for the manufacture of gears and special machinery. The company started business in a one-story building at 2820 Smallman street. Under the management of Mr. Fawcus the growth of the business was so rapid that in 1910 the plant at Ford City, Pa., was purchased. Mr. Fawcus was endowed with great executive ability and a keen inventive brain. Among his many mechanical inventions, the most notable are the machines for cutting herringbone gears. Mr. Fawcus was a member of the American Society of Mechanical Engineers, and the Society of Engineers of Western Pennsylvania.

John G. Rehfuss, age 44, died recently in Wilmington, Del. He had served as superintendent for the George W. Baker Machine Co., Wilmington, for a number of years.

C. C. Williams, who was president and general manager of the G. H. Williams Co., Erie, Pa., manufacturer of grab buckets and conveying equipment, was killed recently when his automobile was struck by a street car.

Herbert B. Knox, president and treasurer of the Charles McCaul Co., Philadelphia, contractor, with which he was connected for 20 years died recently at his home in Philadelphia. He was one of the country's best known structural and architectural engineers. A project that gave him considerable prestige was the building of the Philadelphia mint.

Central West Receives War Orders

Munition Contracts Are Liberally Distributed Among Inland Manufacturers—Fuel Order and Traffic Troubles Hamper Tool Industry—Government Asks for Used Equipment—Navy Department Awards Contract for 60 Locomotive Cranes

PLACING of many contracts for ordnance, shells and other munitions, among manufacturers in the middle west, was reflected by relatively greater buying activity in that territory than in the east, during January. Traffic congestion in the Atlantic states and the vast number of orders already placed with eastern plants have caused an extension of the government's war order efforts to an increasing number of plants all over the country, most of which are undertaking this form of work for the first time and consequently need much new equipment. On the Pacific coast, demand for machine tools has been limited almost exclusively to machines needed for the shipbuilding and destroyer programs, as required by machine shops having subcontracts from the shipyards. The fuel situation seriously affected operations of machine tool builders. Many plants, especially in New England, were on a hand-to-mouth basis in respect to coal, during January, while some had to resort to wood to continue operating. While the fuel administration's closing order at first affected nearly all builders, most of the larger builders of machines received exemptions on much of their work during the latter part of the month and they were enabled to operate on urgent government work on the more recent "workless" days. Prices did not change much during January. In some instances slightly lower quotations were made by manufacturers, who have used up their stocks of higher priced steel and now are obtaining supplies at the government price.

Government's Requirements Are Large

It is estimated that fully 95 per cent of the machine tools being turned out today are being taken into direct or indirect government work. The output of builders is sold up from several months, in the case of some types, to more than a year in others. Much used equipment is being sold and rented for government purposes. The machine tool section of the war industries board during the month made an appeal to dealers, builders and users of tools for assistance in obtaining about 565 planers, 300 radial drills, several hundred engine lathes, about 100 horizontal boring and milling machines, wanted by the ordnance department of the army for delivery by April 1.

Shell Contracts Predominate in Awards

Among the buyers of machine tools during the month were the arsenals at Rock Island, Ill., and Watervliet, N. Y. The Fore River Shipbuilding Corp. closed for about 85 precision lathes, for installation aboard destroyers. The following companies bought equipment for use in making shells: The Hyatt Roller Bearing Co., Newark, N. J., for making 1.7-pound smoke shells; the Crucible Steel Co. of America, for making 30,000 six-inch common projectiles; the John Thomson Press Co., New York, manufacturer of printing presses; the Thurlow Steel Co., for 4.7 shells; the Metropolitan Engine Co., for making 1,100,000 trench mortar shells; Winslow Bros., Chicago, for 155-millimeter shells; the Moon Motor Car Co., St. Louis, for 155-millimeter shells; the Gorham Mfg. Co., Providence, R. I., bought tools for manufacturing 3,000,000 hand grenades. The following companies entered the market for machines needed for fuse contracts: The Stenotype Co., Indianapolis; Indiana Brass Co., Frankfort, Ind.; Frost Mfg. Co., Hall Lamp Co., Kenosha, Wis.; E. W. Bliss Co., Brooklyn; Neptune Meter Co., Long Island City, N. Y.; H. Mueller Mfg. Co., Chicago, which inquired for 100 turret lathes. Ordnance makers in the middle west contributed a large portion of the activity in the machine tool market. Among those buying was the Morgan Engineering Co., Alliance, O., which purchased several hundred machines. The Studebaker Co., Detroit, the Standard Steel Car Co., Hammond, Ind., and Dodge Bros., Detroit, were heavy buyers. Companies receiving miscellaneous war contracts included the following: The F. W. Spacke Machine Co., Indianapolis; Arbuckle & Co., Rushville, Ind.; Wagner Axle Co., Anderson, Ind.; American Standard Metals Co., Paulsboro, N. J.; and Slocum, Avram & Slocum, Inc., New York. The Federal Shipbuilding Co. inquired for 30 to 40 lathes. The Air Nitrates Co. inquired for equipment needed for a machine shop for the government nitrogen plant at Mussel Shoals, Ala.

Award of 60 Locomotive Cranes is Feature

Demand for cranes, as in the preceding month, came mainly from the government and the various shipyards. A feature of last month's business was the placing of 60 locomotive cranes by the bureau of yards and docks, navy department. These cranes, the bulk of which were 15 to 20 tons capacity, were apportioned among various builders. Another large order for locomotive cranes was that of the American International Shipbuilding Corp., involving 28 cranes for its yard at Hog Island, Philadelphia. Twenty of this lot went to the Ohio Locomotive Crane Co., Bucyrus, O., while the remainder went to the Industrial Works, Bay City, Mich. A contract of particular interest was that received by the McMyler-Interstate Co., Cleveland, calling for a 350-ton outfitting crane for the Brooklyn navy yard. This was the largest crane ever awarded. Included in other business placed last month were 15 electric cranes for the Air Nitrates Co., New York, which is building a plant for the government at Mussel Shoals, Ala. The greater portion of this lot went to the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. Another sizable contract involved 11 electric cranes for the Federal Shipbuilding Co., New York. The Cleveland Crane & Engineering Co., Cleveland, received two 50-ton cranes, and the Milwaukee Electric Crane & Mfg. Co., Milwaukee, and the Erie Steel Construction Co., Erie, Pa., shared the remainder of the order. The Cleveland Crane & Engineering Co. also booked five overhead traveling cranes, ranging from 5 to 100 tons, for the Washington navy yard.

Voice Disapproval of Tool Appeal

Dealers Believe That Government Inquiry for Equipment Now in Operation Will Stifle Business in Used Tools—Fuel Difficulties Border on Solution—Traveling Cranes for Washington Navy Yard to Cost $600,000

INSTANCES of disapproval of the recent request made by the machine tool section of the war industries board that machine tool builders and manufacturers rearrange their manufacturing facilities so as to release machinery for government work and sell or lend these tool to the government, are numerous, not only among the 350 dealers in used machine tools throughout the United States, but among manufacturers as well. Several tools of the types specified, it is maintained, are available from dealers for early delivery. Dealers also assert that many tools in the sizes named have been offered during the past few months, but that the government, apparently, had entertained little thought of a possible need for these tools at the time, as no effort was made to secure them. Obviously, the dealer of used machinery is vitally affected by this government request, in that his field for tools and selling activities will be limited.

Confusion still exists among machine tool builders in regard to the exact interpretation of the fuel order; some frankly state that they do not know whether the rule permits them to operate or not. The order is not interfering with government work, at least as far as machine tools are concerned. With the early removal of the ban, which is not a remote possibility, the industry will be enabled to assimilate its large orders.

Inquiries, except from scattered sources, have dwindled in both the machine tool and crane markets. The outstanding feature of the latter market is the government's inquiry for traveling cranes to cost approximately $600,000 and to be installed at the Washington navy yard. In the machine tool market the distribution of about $100,000 worth of equipment for the Watervliet arsenal is conspicuous.

Markets Have Respite From Large Inquiries

ALTHOUGH builders of machine tools were seriously affected by the closing order of the fuel administration during the earlier days of the workless edict, an increasing number of exemptions has been granted to companies engaged in essential government work, until now many plants are running almost to capacity on the fuelless days. Considerable confusion still exists, some companies not knowing whether or not the rules allow them to operate, while others have found it difficult to run part of their plants on essential government work and to shut down part. But, all in all, the workless days no longer are seriously interfering with the government's war program as related to the machinery industry.

Watervliet Arsenal Distributes Orders

Machine tool dealers report a good volume of business, principally for government work, in lots of one to a few tools each. The capacity of manufacturers is so far taken up that it is perceived to be futile to issue long lists with any hope of getting results. The most important buying in the east last week was done by the Watervliet arsenal, which distributed orders for about $80,000 to $100,000 worth of machines, including lathes, drills and boring mills. In general, however, in the states of New York and New Jersey, and in New England, a lull is apparent in large-scale new buying. Reports received in New York from Pittsburgh offices indicate that the lull also is present there. Further west, however, some large buying is being done, principally for plants having ordnance and gun mount contracts. These include the Standard Steel Car Co., Hammond, Ind.; the Studebaker Co., Detroit, and Dodge Bros., Detroit.

Recent activities in the east include the following: The High Speed Hammer Co., Rochester, New York, will enlarge its plant; the Bethlehem Steel Co., it is reported, will erect a large shell-loading plant at Mays Landing, N. J.; the Niles-Bement-Pond Co. will erect a 60 x 200-foot forge shop at Plainfield, N. J.; the navy department has asked for estimates on a boiler shop at Washington; the Eastern Connecticut Power Co., New London, Conn., has drawn plans for a $1,000,000 power plant at Thamesville, Conn., and will purchase two 10,000-kilowatt generators, among other equipment; the Reading railway has begun the construction of a $200,000 roundhouse and a $100,000 machine shop at Philadelphia; the Milton Mfg. Co. will build a machine shop.

Business in Conveying Machinery Slackens

Actual consummation of business in conveying machinery was relatively small last week. The Atlantic Corp., Portsmouth, N. H., in placing several locomotive cranes with the Brown Hoisting Machinery Co., awarded the largest contract reported in the crane market. It was understood that this company would also purchase several overhead traveling cranes; however, it now develops that the company will not buy equipment of this description, but will use hoists instead. The Atlantic Corp. is expanding its plant at Portsmouth, N. H., to erect 10 steel ships for the government. The Lockwood, Greene Engineering Co., Boston, is in charge of the construction. The American Brake Shoe & Foundry Co. is inquiring for two 5-ton electric cranes for Mahwah, N. J. The Worthington Pump & Machinery Corp. continues in the market for a 10-ton electric crane for Holyoke, Mass. The inquiry of the Groton Iron Works, Groton, Conn., for four 5-ton electric cranes for its new shipyard at Alexandria, Va., remains pending. The Newport News Shipbuilding & Dry Dock Co. has placed a contract for two 7½-ton gantry cranes with the Alliance Machine Co., Alliance, O.

Business Drops Off in January

TRANSPORTATION conditions have had a decided effect on machine tool business in the Chicago district and it is distinctly slower than was the case late

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But three years ago, AGATHON Alloys were unknown. This wonderful plant was just nearing completion.

Today, AGATHON is the accepted standard for alloy steels and this great plant, augmented by numerous additions, must work day and night to supply the demand for steels of AGATHON quality.

Intrinsic merit, nothing else, has won them this place of supreme leadership. AGATHON Alloys will serve your purpose best.

AGATHON Chrome Steel
AGATHON Nickel Steels
AGATHON Chrome Nickel
AGATHON Vanadium
AGATHON Chrome Vanadium
AGATHON High Carbon
AGATHON Special Analysis

The Central Steel Co.,
Massillon, Ohio

SALES OFFICES:

Detroit Office—326-27-28 Ford Bldg.,
F. Walter Guibert, District Representative.
Cleveland Office—Hickox Bldg.,
The Hamill-Hickox Co., District Representative.
Chicago Office—1370 Peoples Gas Bldg., 122 S. Mich. Blvd.
C. H. Beach, District Representative.
Philadelphia Office—603 Widener Bldg.,
Frank Wallace, District Sales Manager.
Syracuse Office—601 University Block.
T. B. Davies, District Sales Manager.
J. E. Dockendorff & Co., 20 Broad St., New York,
General Export Agents.

last year. Business for January was much less than during the few preceding months, but same sellers have found it about equal to the average for 1917. Were it not for the heavy buying during some months of last year, January would have stood out more or less prominently. Little business of importance is now pending, and most inquiries are for single tools or smaller lots. This is in marked contrast to the larger requirements recently put forth. Embargoes by railroads are relieved somewhat and some machinery is being shipped from Cincinnati, after a period during which nothing was moved from that city. As an indication of the slow movement of freight, a machine shipped from Chicago to a user 16 miles distant was loaded Jan. 2 and has not yet been received. Some buying is being done for the Rock Island arsenal but no large inquiries are now pending for that purpose. The Wagner Electric Co., St. Louis, has completed six frame buildings of dimensions, 60 x 2000 feet, and contemplates doubling this capacity within 60 days. The United Mfg. & Distributing Co., Chicago, has taken a government contract for fuses and has bought part of its equipment. The Franklin Mfg. Co., Chicago, is preparing to build a factory. The Standard Steel Castings Co. is about to erect a large addition to its plant at Clearing, Ill. The Townsend Mfg. Co., at Janesville, Wis., will build two additional shops. The Lake Superior & Ishpeming railroad will build new shops this year at Marquette, Mich., including a machine shop, blacksmith shop and car repair shops. The Texas Steel Co. has begun to repair and re-equip its blast furnace and pipe foundry at Rusk, Tex., recently bought from the state. Waterworks improvements are being undertaken with the nearer approach of spring weather. Marshalltown, Ia., will add three boilers at its waterworks, and Sioux City, Ia., will install nine air lift pumps, a booster pump, air compressors and engines. Wellington, Kans., will add five electric low-pressure pumps to its waterworks system.

Receive Large Airplane Parts Contracts

GOVERNMENT work on airplane motor parts, huge contracts for which have been let to Cleveland manufacturers, may explain the recent establishment of the offices of the production division of the aviation section of the signal corps in the Union building, Cleveland. Major Frank E. Smith will supervise the work of the division. The enormity of these contracts is made apparent in one instance, that of the National Acme Mfg. Co., Cleveland, which has received contracts covering 95,000,000 parts for liberty motors. Dealers in the Cleveland district report that the inquiries of the past week have come mostly from makers of airplanes or airplane parts and that the inquiries from shipbuilders have been dwindling in size and number. Before the entrance of the nation into war, rubber companies took many machine tools to supplement or replace their equipment. Lately these inquiries have been unusually small and its effect has been perceptible in the Cleveland market owing to its nearness to Akron, the center of the rubber industry. Sales of the past week have not been of spectacular size, but have covered small lots of tools, delivery of which, for the most part, can be made in from 30 to 90 days. The slackening of the automobile production rate is causing a lethargic movement of special machinery and equipment. The National Tube Co., Lorain, O., is in the market for additional equipment including a planer, a boring mill and three lathes. Purchases of new equipment which are being made by the Cleveland Tractor Co., Cleveland, appear to be part of a continuous process rather than in the way of specific inquiries. New contracts acquired by the Recording & Computing Machine Co., Dayton, O., following a recent trip of officials to Washington, have been productive of new inquiries for machine tools from that company.

To Build Second 150-Ton Pontoon Crane

Additional exemptions from the Monday closing order are permitting a number of northern Ohio crane manufacturers to push work on government crane contracts. The Wellman-Seaver-Morgan Co., Cleveland, has received an order for a duplicate of the 150-ton revolving pontoon crane, which it built for the Norfolk navy yard, Norfolk, Va. This one is to be completed the latter part of 1918 and will be installed in the Mare Island navy yard, San Francisco. Orders for charging cranes likewise are being filled by this company for government arsenals at Watertown, N. Y., and Charleston, W. Va. Government orders continue to receive the major portion of attention.

New Construction and Equipment

Concise and Timely Business Building Opportunities from the Field of Industry

Along the Middle Atlantic Seaboard

BROOKLYN, N. Y.—The Vandyke Smelting & Refining Works has been chartered with $300,000 capital. Incorporators include A. J. C. Weimer, M. Mulstein and E. Strauss, 392 Thirtieth street.

BROOKLYN, N. Y.—A charter of incorporation has been granted to the Eastern Foundry Corp., capitalized at $20,000. Incorporators are H. Jacobson, G. A. Weldon and W. Lowenthal, 35 Nassau street.

BROOKLYN, N. Y.—Contracts for the erection of a power house addition and an awarded to the Structural Construction Co., electrical gallery to cost $500,000 have been Dayton, O., by a concern whose name is withheld. W. Weissenberger Jr., 32 Union square, New York, is architect.

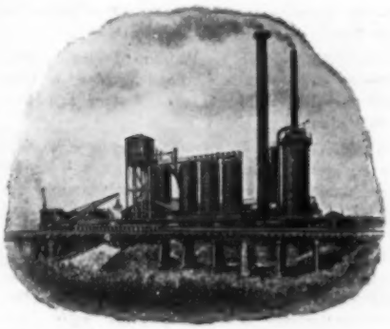
BUFFALO.—Plans are being prepared by the Kellogg Products Co., 98 Delaware avenue, for a 2-story, 30 x 64-foot transformer houre, 2-story, 30 x 112-foot boiler house and a 1-story, 50 x 57-foot boiler house addition. Total cost is estimated at $40,000. R. J. Reidpath is the contractor in charge.

BUFFALO.—The Barcalo Mfg. Co., 225 Louisiana avenue, is having plans prepared by Kidd & Hopkins, architects, Franklin street, for a 1-story, 40 x 100-foot factory addition to cost about $6000.

BUFFALO.—Deck Bros., Inc., recently organized with a capital of $35,000, plans to build a foundry and machine shop. B. L. Lempenau is in charge.

GLENDALE, L. I., N. Y.—A $25,000 plant will be erected by William Greilich. Louis Allmendinger, 20 Palmetto street, Brooklyn, N. Y., is architect.

NEW YORK.—The Cary Spring Works, 242 West Twenty-ninth street, has leased a site



DELAWARE RIVER STEEL COMPANY

MANUFACTURERS OF PIG IRON

CHESTER, PENNSYLVANIA

LOW PHOS

To Pig Iron Consumers:

An even hundred words concerning "Delaware" Low Phosphorus Pig Iron. We desire to place this iron in the works of every consumer of low phos iron. Those who have used it are sending us repeat orders. Every one should try it. Now is the time. Your regular supply is not dependable. The shortage in all grades is appalling and the situation is becoming more acute. "Delaware" contracts will be completed. We are in a position to keep our promises. "Delaware" Iron is copper bearing. It is the best of its kind. Buy "Delaware" and learn to depend upon "Delaware" Pig.

DELAWARE RIVER STEEL CO.

adjoining its present plant, on which it plans to build extensions.

NEW YORK.—The Wedge Joint Corp. has been organized with $100,000 capital to manufacture engines, boilers and heavy hardware. The incorporators are T. E. Vandorn, E. S. Merrill and J. A. Twichell, 316 West Seventy-ninth street.

NEW YORK.—The C. H. Radiator & Mfg. Co. has been organized with a capital of $5000. The incorporators are C. H. and A. H. Lavaty, 1427 Avenue A.

NEW YORK.—The Puritan Steel Co., recently incorporated with a capital of $50,000, plans to erect a factory. W. J. Miller, 60 Wall street, is in charge.

ROCHESTER, N. Y.—The Rochester Melting Works has been incorporated with $50,000 capital. G. J. Skivington, G. M. Schmidt and G. Baxter are interested.

ROCHESTER, N. Y.—Booth Bros., manufacturers of shoe machinery, plan to rebuild their plant, recently damaged by fire.

ROCHESTER, N. Y.—The plant of the Eureka Foundry Co., 108 Browns Race, has been damaged by fire with a loss of $45,000.

SCHENECTADY, N. Y.—J. C. Aitkin, 216 South Centre street, manufacturer of storage batteries, plans to build a 1-story, 50 x 80-foot plant addition.

SYRACUSE, N. Y.—The Caldwell & Ward Brass Co. contemplates repairs to its foundry, to cost $10,000. The plant was recently damaged by fire. L. F. Meagley, 103 Decker street, is in charge.

AMBRIDGE, PA.—The Asbestos Protected Metal Co., Pittsburgh, has had plans prepared for a 40 x 200-foot factory. H. H. Robertson is interested.

BUTLER, PA.—Plans are being drawn for a 1 and 3-story, 170 x 250-foot addition to the plant of Spang & Co., Etna street. Cost will be about $150,000.

MILLERSBURG, PA.—A machine shop to be erected by Brubaker Bros., will be 1-story, 75 x 100 feet. Thomas Hamilton, 11 North Sacken street, is architect.

PHILADELPHIA.—The Hero Mfg. Co. is having plans drawn for a 3-story factory building to cost $30,000. The Austin Co. is the contractor.

PHILADELPHIA. — The Lutz Co., 3111 Grays Ferry avenue, manufacturer of machinery, has purchased a site at Bambrey and Morris streets on which it plans to build a 60 x 200-foot factory.

PHILADELPHIA.—C. V. Roberts, Church street, plans to erect a $10,000 addition to his machine shop.

WILLIAMSPORT, PA. — The National Foundry Mfg. & Supply Co., whose plant has been severely damaged by fire recently, plans to rebuild at once. The company, of which G. D. Gingrich is manager, has been working on government orders.

WILLIAMSPORT, PA.—A $15,000 addition will be erected at the plant of the Valley Iron Works. Bids probably will be taken in the spring.

CAMDEN, N. J.—Fire of incendiary origin has recently caused a loss estimated at $500,000 to the plants of the Van Austin Casting Pattern Co., Wedmore & Co., wire workers, the William Gravers Machine Co. and the George Meyers Machine Co. The last named concern manufactures gaskets for airplanes.

ELIZABETH, N. J.—The Duesenberg Motors Corp. contemplates the erection of large additions to its present plant.

NEWARK, N. J.—John Campbell & Co., Plum Point lane, has awarded a contract to Enstice Bros. for a 1-story plant addition to cost $5800.

PATERSON, N. J.—William Jessop, manufacturer of tool steels, has awarded a contract for the rebuilding of a 4-story structure at his plant.

ROCKAWAY, N. J.—The factory of the Rockaway-MacKinnon Axe Co. has recently been damaged by fire. Edward Snook, an official of the concern, says a larger plant will be built on the site.

WILMINGTON, DEL.—A charter of incorporation has been granted to the Universal Iron Products Co., capitalized at $1,200,000, to manufacture iron bars, steel rails, culverts, etc. Incorporators include William F. O'Keefe, M. Gehrman and E. E. Wright.

BALTIMORE.—Contract for a $10,000 addition to the machine shop of the Autogenous Welding & Equipment Co. has been awarded to Henry Momberger, general contractor.

BALTIMORE.—The Cawman Building Co. will erect a $100,000 distributing station, three stories, 66 x 90 feet, for the Consolidated Gas, Electric Light & Power Co.

CURTIS BAY, MD.—Bids soon will be taken by the R. C. Hoffman Co. for the erection of a $130,000 steel plant. Address Continental building, Baltimore.

EDGEWOOD, MD.—The contract for the erection of a $3,000,000 chemical plant at this place has been awarded by the government to Mellon & Stewart, Pittsburgh.

NORFOLK, VA.—The Empire Machinery & Hardware Corp., 36 Commercial place, has increased its capital from $100,000 to $125,000 and plans to build an addition to its plant.

ROANOKE, VA. — The Republic Motor Truck Co., Alma, Mich., plans to build an assembling plant here.

Activities in the Central States

APPLETON, WIS.—T. M. Purtell, secretary, Reliance Motor Truck Co., 821 College avenue, will receive bids until Feb. 1 for the construction of a factory building, 76 x 300 feet, of reinforced concrete, steel and brick, with sawtooth roof. The estimated cost is $30,000. A. Arthur Guilbert, Racine, Wis., is architect and engineer.

GREEN BAY, WIS. — The Green Bay Barker Co. has awarded a contract to V. Derenne, 1211 Day street, for erecting a 1-story brick and concrete machine shop addition, 60 x 120 feet. The company manufactures sawmill and paper mill machinery and equipment.

HARTFORD, WIS.—Bids will be received until Feb. 19 by the city for a deep well pump and a motor. A. Martin, city engineer, is in charge.

JANESVILLE, WIS.—The Townsend Mfg. Co., manufacturer of internal combustion engines and tractors will build two shops, 60 x 100 feet and 20 x 40 feet in size, respectively.

JANESVILLE, WIS.—Bids will be received until Feb. 10 by the board of public works for an addition to the pumping station and the installation of a pumping engine. C. V. Keich is city engineer.

MILWAUKEE.—The Trico Fuse Mfg. Co. has been incorporated with $100,000 capital to conduct the business of the Arrow Fuse & Mfg. Co., 2416 North avenue, manufacturer of fuses and electric supplies. The incorporators are F. C. Geiler, Oscar H. Jung and Arnold Reuss.

MILWAUKEE.—D. & M. Karger, proprietors of the Eagle Knitting Mills, 382 Broadway, are having plans prepared by Martin Tullgren & Sons, architect, for a 2-story fireproof knitting mill, to be operated by electric power, and cost about $35,000 complete. The area will be 30 x 125 feet.

NEW HOLSTEIN, WIS.—The John Lauson Mfg. Co., manufacturer of gas engines, tractors and farm machinery, will enlarge its plant. The capital stock has recently been increased from $500,000 to $1,000,000, as large orders for tractors have been received from government and private sources which will require the purchase of additional machinery and tools as well as the erection of shop additions.

SHEBOYGAN, WIS. — Bids will be received by the county highway commissioner until Feb. 1 for the construction of a steel truss bridge over the Pigeon river near Sheboygan Falls. The structure will be 85 feet long and have a 16-foot roadway. Jerry Donohue is consulting engineer.

SUPERIOR, WIS.—Edward Kaner plans to maintain a scrap yard at Banks avenue and North Fourth street, and will require crane, magnet, and shearing equipment.

DETROIT.—The Hinkley Motors Corp. has awarded the contract for a 1-story brick and steel factory addition to be erected on Fort street at Twenty-third street.

DETROIT.—The T. C. Mahon Co., sheet metal manufacturer, is building a 1-story addition, 40 x 93 feet in size, to cost $5000.

FLINT, MICH.—Bonds for $128,000 have been voted to build a waterworks system. E. C. Shoecraft is city engineer.

GRAND RAPIDS, MICH. — The J. G. White Engineering Corp. has obtained a permit to build a 1-story brick and steel factory to cost $200,000.

GRAND RAPIDS, MICH.—The Truman M. Smith Co. has been incorporated with $60,000 capital to manufacture machinery and foundry equipment. I. T. Wright, C. N. Smith and Gerald McCoy are interested.

LANSING, MICH.—The city council contemplates authorization of the building of a municipal gas plant to cost about $1,500,000.

MARQUETTE, MICH.—The Lake Superior & Ishpeming, and the Munising, Marquette & Southeastern railroads, H. R. Harris, general manager, will shortly begin construction of new shops, at the ore docks of the former road, to cost $425,000, and to include a roundhouse with boiler room, an 80-foot steel turntable, a machine and work shop 115 x 143 feet, blacksmith shop 42 x 82 feet, oil house coaling station, car repair shop, steel shop 21 x 41 feet and other buildings.

MUSKEGON, MICH. — The Linderman

OHIO STEEL CASTINGS

OUT in the wheat fields of the Great Northwest, where they harvest the Nation's grain, time is just as important as in the busiest factory.

Plowing, planting, reaping, threshing must be done on Nature's schedule. Mistakes or loss of time can never be made up. It is imperative that every machine and implement used be absolutely reliable.

The fact that Ohio Steel Castings are sought for use in tractors and other types of farm machinery, is proof of their quality.

Quality PLUS Service

The Ohio Steel Foundry Co.

Plants:

Springfield, Ohio Lima, Ohio Bucyrus, Ohio

Steel & Machinery Co., 1075 Lake street, is building a 75 x 400-foot addition to its plant.

SAGINAW, MICH.—The Erd Motor Co. has increased its capital from $150,000 to $200,000 and will build an addition 90 x 240 feet in size. The company manufactures kerosene motors for tractors.

CHICAGO.—The Franklin Mfg. Co., Carl Malmberg, manager, 20 East Jackson boulevard, will build a factory and office building to cost $50,000 at Clybourn avenue and Chester street.

CHICAGO. — The Western Brass & Mfg. Co., 2007 Marshall boulevard, has had plans prepared by L. Novy, architect, 3223 West Twenty-second street, for a 1-story addition.

CHICAGO.—The Roth Mfg. Co., manufacturer of car heating apparatus, 118 South Clinton street, has bought a tract of land at Sixteenth street and Kilbourn avenue on which it will build a 1-story plant to cost $60,000.

CHICAGO. — The Republic Flow Meters Co., 565 West Washington boulevard, has increased its capital from $25,000 to $50,000 to provide for plant extensions.

CLEARING, ILL. — The Standard Steel Castings Co. will build a 1-story plant addition, 126 x 402 feet in size, to cost $100,000. Davidson & Weiss, 53 West Jackson boulevard, Chicago, are architects.

EAST ST. LOUIS, ILL.—The Durbin Automatic Train Connector Co. has begun the construction of a 2-story foundry to cost $25,000, on Bond avenue. Main offices are in the Pontiac building, St. Louis, Mo.

ROCK ISLAND, ILL. — The Western Pump Co. has been incorporated with $30,000 capital by G. A. Scheling, J. F. Harper, and B. Mulhausen.

CONNERSVILLE, IND.—The Rex Mfg. Co., C. C. Hull, president, will build a 1-story power plant 68 x 120 feet in size.

BRISTOE, IND. — The Harms Motor Co. has been incorporated with $100,000 capital to manufacture automobiles by N. I. Harms.

INDIANAPOLIS.—The Ideal Tool Works has been incorporated with $20,000 capital to manufacture automobile parts and tools. Jesse W. Titus, E. L. Crum and Edward L. Klingholtz are interested.

INDIANAPOLIS.—The J. Edward Harrison Mfg. Co. has been incorporated with $500,000 capital to manufacture machinery. Incorporators are M. C. Harrison, George C. Harrison and J. Edward Harrison.

INDIANAPOLIS. — The Victor Screw Works of Indiana has been incorporated with $50,000 capital by E. C. Miller, G. H. Power and Roy C. Allshouse.

INDIANAPOLIS. — The Weidely Motors Co. has increased its capital from $100,000 to $500,000 and will enlarge its plant and buy new equipment. The company manufactures airplane and tractor motors.

MUNCIE, IND.—The Warner Gear Co. will build a 1-story addition 139 x 450 feet, for which bids will be taken about Feb. 15.

PERU, IND.—The Model Gas Engine Co. will build additions to cost $50,000.

TERRE HAUTE, IND.—The Larsh Road Machinery Co. has been incorporated with $5000 capital stock by Thomas R. Woodburn, Thomas Ferguson and John M. Larsh.

UNION CITY, IND.—The Titan Engineering Co., recently incorporated with $50,000 capital, will engage in the manufacture of starting, lighting and ignition equipment, and will take over the plant formerly operated by the Tritt Electric Co.

VINCENNES, IND.—The Vincennes Galvanizing Iron Works has been incorporated with $10,000 capital. Incorporators include John H., M. O., and Peter R. McCarty.

AKRON, O.—The plant of the Ohio Wire Goods Mfg. Co., North Case avenue, has been damaged by fire with a loss of about $175,000. A. H. Nosh, chairman of the board of directors, announces that the company will rebuild shortly, as it has undertaken orders for war materials from the government.

CANTON, O.—The Berger Mfg. Co., 1038 Belden street, manufacturer of steel bins, shelving, etc., plans to build ten steel mills, aggregate cost to be about $5,000,000.

CINCINNATI.—The Cisco Machine Tool Co. is building an addition which will double the capacity of its plant, and is in the market for a large boring mill. G. Mil. Horton is general manager of the company.

CLEVELAND. — A contract has been awarded to the George A. Rutherford Co., 2160 East Eighteenth street, for a heat treating plant for the Perfection Spring works of the Standard Parts Co. F. E. Borton is in charge.

CLEVELAND.—The Rubay Co. has leased a site at 1328 West Seventy-eighth street on which it proposes to build a factory.

CLEVELAND. — The Peerless Pattern Works Co. has been incorporated with $10,000 capital by Neil Brogan and M. D. Bracken.

COLUMBUS, O. — The American Water Motor Co., 108 West Spring street, has purchased a site on which it plans to build a factory. L. Lewis is president.

CONNEAUT, O. — The Conneaut Metal Works plans to increase its capital from $40,000 to $100,000 to provide for building plant extensions. The company has recently received extensive government contracts.

DAYTON, O.—The plant of the Dayton Fan & Motor Co., Ludlow road and Bayard street, has been damaged by fire with a loss of $30,000. W. F. Phelps, president of the company, announces that plans for rebuilding will be considered at once.

DAYTON, O.—The Dayton Bronze Bearing, which has recently increased its capital from $10,000 to $30,000, plans to build a 50 x 150-foot brick and concrete factory addition. The company will also install considerable new equipment for the manufacture of brass, bronze and aluminum castings.

HUNTINGTON, W. VA.—Plans are being drawn for a factory to be built at Huntington by the Jeffrey-Dewitt Co., Butler street and Grand Trunk railroad, Detroit. Cost is estimated at $100,000.

Western and Intermountain Territory

HIBBING, MINN.—The village will build a municipal coal and gas plant to cost $182,000, and to include two buildings and a gas holder. J. P. Murphy is in charge.

BURLINGTON, IOWA.—The Northwestern Stamping Co., A. L. Bilkin, vice president, will build a 1-story factory 100 x 300 feet in size.

DES MOINES, IOWA. — The Whitnell Mfg. Co., Kingsley, Iowa, manufacturer of window sash, plans to remove its plant to this city, and will build a new factory as soon as a suitable site can be found. Charles Whitnell is president.

DES MOINES, IOWA.—The city plans a new waterworks plant, changing the source of supply to the Des Moines river. K. Kastberg is city engineer.

MARSHALLTOWN, IOWA.—Bids will be opened soon for three boilers to be installed at the waterworks pumping station. W H. Steiner is city engineer.

SIOUX CITY, IOWA.—Bids will be taken soon by the city for nine air lift pumps, air compressors, booster pump and engines to cost $50,000. T. H. Johnson is city engineer.

KANSAS CITY, MO.—The American Machine Works Co. has been incorporated with a nominal capital of $5000. Michael Nester and Warren H. Turner are interested.

WELLSVILLE, MO. — The Chicago Fire Brick Co. contemplates the erection of a plant to cost $1,000,000.

CORSICANA, TEX.—The city plans to issue $400,000 in bonds to build a waterworks system.

HOUSTON, TEX.—The Hannah Conveyor Co. has been incorporated with $15,000 capital by Edward Hannah, J. G. Bilton and Robert Kornbeck.

ORANGE, TEX.—The Orange Co. Irrigation Canal Co. contemplates building a pumping plant to cost $25,000.

RUSK, TEX.—The Texas Steel Co., L. P Featherstone, president, Beaumont, Texas, has begun to repair and improve the blast furnace and pipe foundry recently bought from the state of Texas. New equipment will be required.

SAN ANTONIO, TEX.—The Alamo Iron Works is constructing a 4-story reinforced concrete mill supply warehouse, together with an addition to its machine shop. The latter will be 24 x 60 feet and a number of new machine tools will be installed. The Alamo Iron Works operates a gray iron foundry, machine shop and boiler plant for the manufacture of agricultural, plantation and oil well machinery.

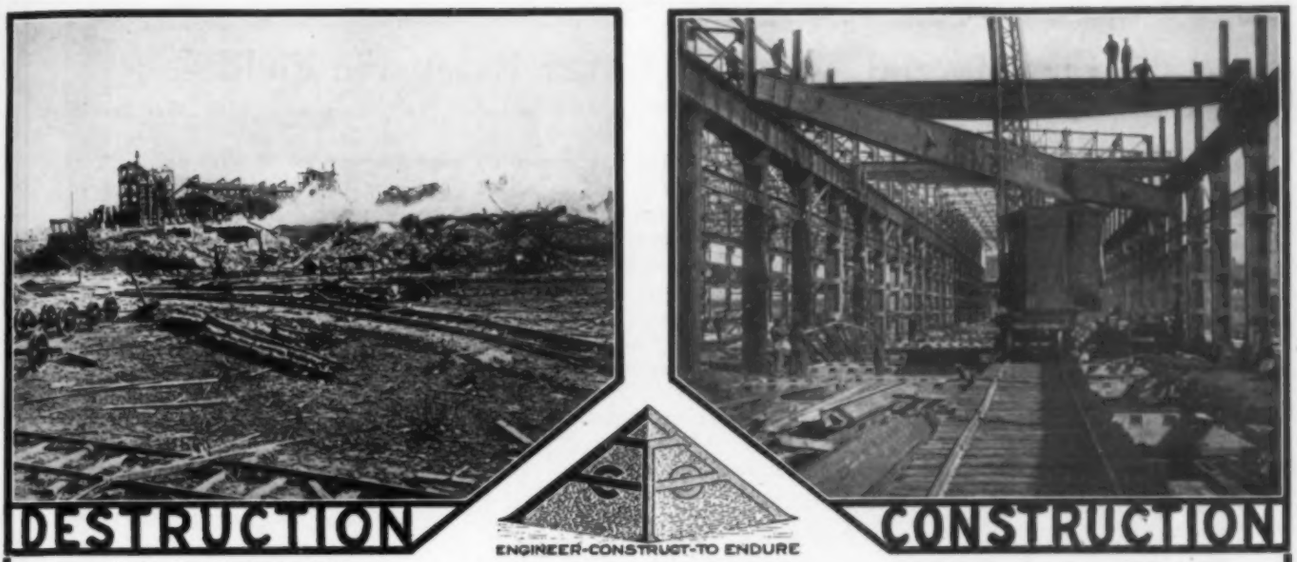
OKLAHOMA CITY, OKLA.—The Midland Motor Car & Truck Co., J. Y. Aydelotte, manager, 1118 East Twelfth street, will build a 1-story plant 80 x 500 feet, to cost $125,000.

WELLINGTON, KANS.—The city plans to install five low pressure pumps and electrical equipment. J. R. Murphy is superintendent.

FREMONT, NEBR.—The city plans to erect a new pumping station to cost between $20,000 and $35,000. L. M. Roessler is city engineer.

DENVER, COLO.—The Union Iron Products Co., 1719 Stout street, contemplates erecting a factory for the manufacture of corrugated and sheet iron products, including culvert pipes.

WILLIAMS, ARIZ.—The city plans to build a waterworks system costing $55,000.



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While they're devastating Europe— America is building up her industries

BOTH continents are involved in the World War, but America is not suffering the destruction of her industries by bombardment as in Europe. Instead, there is a forced demand for construction to furnish facilities needed to produce more than ever before.

The industrial concerns are feeling this pressure as much as the railroads. The work of enlarging and increasing their facilities is very urgent. The scarcity of men and materials makes it difficult for them to undertake and supervise the work of expanding their plants, but they can engage the services of specialists already organized and equipped for that purpose.

The Arnold Company has engineers experienced in analyzing industrial problems and making reports and recommendations. It has the necessary facilities available for performing engineering and construction work, and rearranges equipment for economical operation.

This is the kind of work The Arnold Company has been doing for over 20 years. Being industrial plant specialists, it can save you money in reconstructing, enlarging or rearranging your present plants as well as in building new.

The Arnold Company

ENGINEERS — CONSTRUCTORS

ELECTRICAL — CIVIL — MECHANICAL

105 South La Salle Street
CHICAGO

Commercial Activities Cover Extensive Field

THE Pittsburgh Export Co. has removed to the twelfth floor of the First National Bank building, Fifth avenue and Wood street, Pittsburgh. Special accommodations have been provided for the entertainment of visitors from out of the city.

Offices have been opened by the Unity Connellsville Coke Co., in the First National Bank building, Latrobe, Pa. The offices formerly were located at the plant.

A change in corporate title is announced by Trimble, Mudge & Co., Pittsburgh, to that of the H. N. Trimble Steel Co.

J. J. Nordman & Co., Pittsburgh, purchasing agents for foreign account, announce their removal to larger quarters, suite 2211-2212 Farmers Bank building.

Benstock & Rosenberg, dealers in old metals, have removed their headquarters to 22-52 Benders place, Buffalo.

A sales office has been opened by the Sizer Forge Co., Buffalo, at 908 First National Bank building, Pittsburgh. D. A. Stuart has been made district manager of sales.

The Chicago warehouse of the Bridgeport Chain Co., Bridgeport, Conn., has been removed from 204 North Wabash avenue to 119 South Jefferson street.

The Vandyck Churchill Co. has moved its Philadelphia office from The Bourse to 734 Widener building. C. H. Hamersley is manager.

The name of the Philadelphia Steel & Forge Co., New York, has been changed to that of the Tacony Steel Co. No change in the personnel of the organization has been made.

The Worcester Flexible Tubing Co., Worcester, Mass., has removed to Whitman, Mass., where it will be consolidated with the Special Tool Co.

The offices of George M. Demorest, consulting engineer, have been removed from the Dollar Savings & Trust building to 907 and 959 Union Arcade building, Pittsburgh.

The United Steel & Metal Corp. has removed from 90 West street, New York, to larger quarters in the Park Row building.

An office has been opened by the Mesta Machine Co., Pittsburgh, at 312 Munsey building, Washington.

Removal of the offices of the High Speed Tools Corp., New York, to 43 Exchange place, has been effected.

Permanent offices have been established by the Walter A. Zelnicker Supply Co., St. Louis, at 627, Plymouth building, Minneapolis. Richard K. Papin has been made district manager.

New Trade Publications

LATHES.—David A. Wright, Chicago, has recently acquired the rights of the old George B. Fifield lathes, which were originally built at Dexter, Me., and is proceeding with their manufacture. They are being made in sizes from 24-inch to 96-inch swing. They are described in a catalog now being distributed.

SHOP ACCESSORIES. — The Western Tool & Mfg. Co., Springfield, O., has issued a 96-page catalog describing lathe tools, clamps, dogs, expanding mandrels, wrenches, shop stands, trucks, shop boxes, grinders, power hack saws, vises, etc. The catalog is well illustrated and specifications of each article are given.

DRILLING AND TAPPING MACHINES —A 20-page folder has recently been issued by the Langelier Mfg. Co., Providence, R. I., describing a line of drilling and tapping machines. These include precision belt-driven pedestal type drills, bench drills, floor type gang drills, bench type gang drills and a single spindle, vertical tapping machine furnished in both floor and bench types. These tools are supplied for both belt and motor drive.

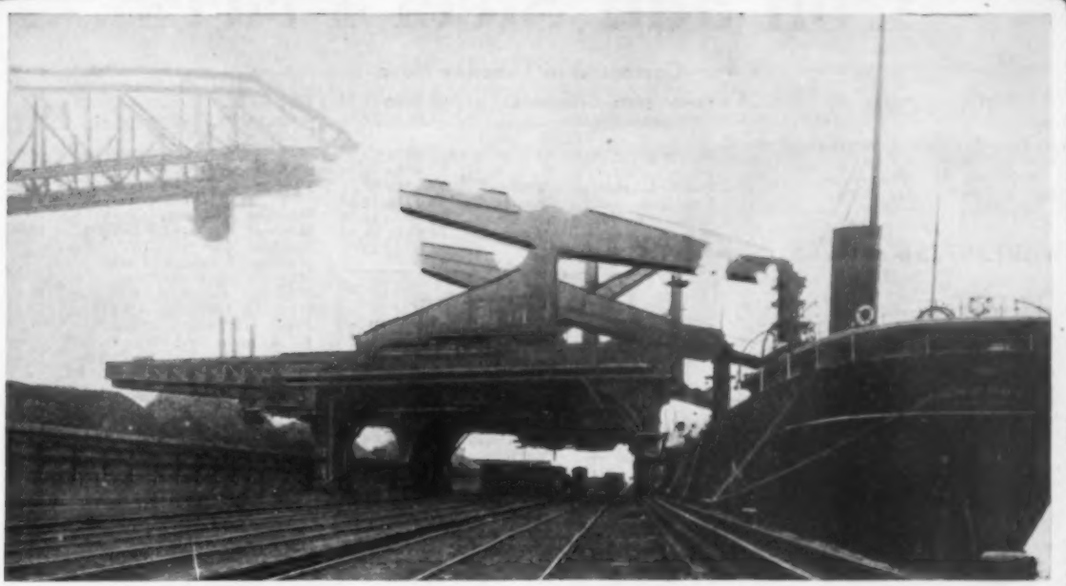
BRASS CASTING.—"Every brass or bronze casting represents a multiplicity of foundry operations. Only when each one of these is performed as if it were the whole job and everything depended on doing it right, will the finished work measure up to its possibilities." These are the opening sentences of a folder recently published by the Aluminum Castings Co., Cleveland, in which that company endeavors to show brass foundrymen the virtues of the overhead telpher system in making uniform castings. A specially alloyed bronze manufactured by the Aluminum Castings Co. is briefly described.

TIN PLATE.—The American Steel Co., manufacturer of wire nails and tin mill products, with general offices in the Park building, Pittsburgh, and plants at Waynesburg and Ellwood City, Pa., has just issued its latest catalog. It is an exceptionally well compiled brochure, printed on high grade paper and neatly bound. The catalog in addition to supplying concisely prices and illustrations of products produced by the company also includes illustrations of its plants and their equipment, and carries a fund of data showing the method of manufacturing tin plate, as well as instructions for ordering and handling.

HEATER UNITS. — The Cutler-Hammer Mfg. Co., Milwaukee, recently published a short folder illustrating and describing a standardized electric space heater unit. This unit may be used in crane cabs, pump and instrument houses, watch or signal towers and for many other purposes. The number of units required depends upon the service for which the heater is to be used and such other conditions as temperature, size of room, etc. They are rated at 500 watts and may be connected to any direct or alternating current lighting or power circuit of 115, 230 or 250 volts pressure. The units are about the size of an ordinary 2-foot ruler, the thickness being only $\frac{1}{8}$ of an inch.

LINE PIPE. — The National Tube Co., Pittsburgh, recently issued a folder devoted to pipe. A remarkable example of the ductility of the pipe manufactured by this company is shown in a torsional test illustrated in the folder. A twisting force of 713,000 inch pounds was subjected to an 8-inch pipe. Although the pipe was twisted more than once around it did not crack. The wall thickness of the pipe is only $\frac{1}{16}$-inch and it weighs about 28 pounds to the foot. The entire folder is designed to present clearly the flexibility of the pipe. An interesting example is shown in a halftone illustration which shows 26 lengths of pipe connected together tangled up on the ground. The pipe was blown out of a well by the force of gas without breaking a single joint in its entire length.

FOUNDRY PANS.—An unusually attractive booklet of 24 pages, partly illustrated with colorplates and devoted to clay machinery such as grinding pans, is being distributed by the American Clay Machinery Co., Bucyrus, O. These pans, designed for mixing sand for foundry purposes are built in four sizes, 5, 7, 8 and 9 feet in diameter. The pans of these machines are held in place by two heavy A-shaped frames, across the top of which is bolted a heavy supporting frame. The last mentioned frame holds the vertical shaft and the bevel gear and pinion. The mullers are supported on steel shafts, independently of each other. The ends of these shafts are provided with shoes which move in guides in the frame and in the shroud encircling the vertical shaft. The mullers are equipped with tires which are readily removed when worn. The space between the muller and muller plates may be adjusted as desired.



Steel Giants Do Work of Thousands of Men

All of the large modern ore docks constructed during the last six years have been equipped with **Hulett Boat Unloaders.** These machines have become a standard for unloading Iron Ore, and ***they are equally well adapted for unloading Coal.***

Hulett Unloaders are built in the following sizes and guaranteed capacities: **For Ore:** *17 Ton Buckets*, capacity 1,250,000 tons per season; *15 Ton Buckets*, capacity 1,000,000 tons per season; *10 Ton Buckets*, capacity 750,000 tons per season. **For Coal:** *8 Ton Buckets*, capacity 500,000 tons per season.

Hulett Unloaders require (1) fewest number of men, (2) lowest labor cost per ton, (3) lowest power cost per ton, (4) lowest maintenance cost per ton.

Complete Ore and Coal Handling Stations, equipped with Boat Unloaders, Car Dumpers, Rehandling Bridges, etc., are a specialty of The W-S-M Company.

Bulletins are in preparation on Ore and Coal Handling Machinery. *Send for your copies.*

The four Unloaders pictured above constitute the Pennsylvania Railway's Whisky Island installation at Cleveland, Ohio.

Principal Products of The W-S-M Company
Steel Plant Equipment:
Manipulators, Furnaces,
Charging Machines, etc.
By-Product
Coke Oven Machinery.
Shipyard Cranes.
Hoisting and Mining Machinery.
Ore and Coal Handling Machinery.
Special Large Cranes.
Gas Producers, Gas Valves.
Hydraulic Turbines.
Johnson Hydraulic Valves.
Steel Castings.

WELLMAN SEAVER MORGAN COMPANY
CLEVELAND
OHIO U.S.A.

Iron and Steel Prices

Corrected to Tuesday Noon

IRON ORE

Superior Ores, Per Ton, Lower Lake Ports.	
Old range Bessemer, 55 iron	$5.95
Mesabi Bessemer, 55 iron	5.70
Old range non-Bess., 51½ iron	5.20
Mesabi non-Bess., 51½ iron	5.05

WAREHOUSE PRICES

Steel bars, Chicago	4.10c
Steel bars, Cleveland	4.035c
Steel bars, Detroit	4.085c
Steel bars, Philadelphia	4.10c
Steel bars, New York	4.095c
Steel bars, St. Louis	4.17c
Steel bars, Cincinnati	4.085c
Steel bars, St. Paul	4.22c
Steel bars, Buffalo	4.05c
Iron bars, Buffalo	4.65c
Iron bars, Chicago	4.10c
Iron bars, Cleveland	3.985c
Iron bars, Detroit	4.75c
Iron bars, St. Louis	4.17c
Iron bars, Cincinnati	4.085c
Iron bars, Philadelphia	4.50c
Iron bars, New York	4.659c
Shapes, Chicago	4.20c
Shapes, Detroit	4.185c
Shapes, St. Louis	4.27c
Shapes, St. Paul	4.32c
Shapes, New York	4.195c
Shapes, Cleveland	4.135c
Shapes, Philadelphia	4.20c
Shapes, Buffalo	4.15c
Shapes, Cincinnati	4.185c
Plates, Buffalo	4.40c
Plates, Chicago	4.45c
Plates, Detroit	4.435c
Plates, St. Louis	4.52c
Plates, St. Paul	4.57c
Plates, New York	4.445c
Plates, Cleveland	4.385c
Plates, Philadelphia	4.45c
Plates, Cincinnati	4.435c
No. 10 blue anl. sheets, Chi.	5.45c
No. 10 blue anl. sheets, Cleve.	5.385c
No. 10 blue anl., Buffalo	5.40c
No. 10 blue anl., sheets, St. L.	5.52c
No. 10 blue anl. sheets, Cinci.	5.435c
No. 10 blue anl. sheets, St. Paul	5.57c
No. 10 blue anl. sh., Detroit	5.435c
No. 28 black sheets, Chgo.	6.45c
No. 28 black sheets, Cleve.	6.35c
No. 28 black sheets, Cinci.	5.45c
No. 28 black, Detroit	6.435c
No. 28 black sheets, St. L.	6.52c
No. 28 black sheets, St. Paul	6.57c
No. 28 galv. sheets, Chgo.	7.70c
No. 28 galv. sheets, Cleve.	7.60c
No. 28 galv. sheets, Cinci.	6.635c
No. 28 galvanized, Detroit	7.685c
No. 28 galv. sheets, St. L.	7.77c
Hoops, Cleveland	4.885c
Hoops, Detroit	4.935c

IRON AND STEEL SCRAP

STEEL WORKS USE
(Gross Tons)

Bundled sheets, Pittsburgh	**$22.00 to 23.00**
Bundled sheets, Cleveland	24.50 to 25.25
Bundled sheets, Buffalo	22.00 to 24.00
City wrought, short, N. Y.	27.50 to 28.00
Frogs, switches, guards, St. L.	30.00 to 31.00
Frogs, switches, guards, Chgo.	30.00
Heavy melting steel, Pitts.	30.00
Heavy melting steel, Buffalo	30.00
Heavy melting steel, Chgo.	**30.00**
Heavy melt'g steel, Cleveland	30.00
Heavy melting steel, Cinci.	**27.00 to 27.50**
Heavy melting steel, east. Pa.	30.00
Heavy melting steel, N. Y.	29.50 to 30.00
Heavy melting steel, St. L.	29.00 to 29.25
Heavy melting steel, Birming.	23.00 to 24.00
Hydraulic press, sheets, Cleve.	28.50 to 29.50
Hydraulic press, sheets, Pitts.	27.00 to 28.00
Hydraulic press, sheets, Chgo.	27.00 to 27.50
Low phos. steel, Buffalo	40.00
Low phos. steel, Pittsburgh	40.00
Low phos. steel, eastern Pa.	40.00
Shoveling steel, Chicago	**30.00**
Shoveling steel, St. Louis	27.50 to 28.00
Steel rails, short, Chicago	34.00 to 34.50
Steel rails, short, Cleveland	32.00 to 33.00
Steel rails, short, St. Louis	36.50 to 37.00
Steel rails, old, Birmingham	28.00 to 30.00
Stove plate, Cincinnati	19.00 to 19.50
Stove plate, St. Louis	20.50 to 21.00
Stove plate, N. J. points	21.50
Stove plate, Birmingham	19.00 to 20.00
Stove plate, Buffalo	25.00
Stove plate, eastern Pa.	23.00 to 24.00
Stove plate, Cleveland	21.00 to 22.00
Stove plate, Pittsburgh	**20.00 to 21.00**
Cast iron borings	11.00 to 12.00

(Net Tons)

Boiler plate, cut, No. 1, Chgo.	$22.00 to 23.00
Boiler plate, cut, No. 1, St. L.	22.50 to 23.00
Bundled sheets, Cincinnati	17.00 to 17.50
Knuckles, coup., Chicago	34.00 to 34.50
Knuckles, coup., St. Louis	31.50 to 32.00
Springs, Chicago	38.50 to 39.00
Stove plate, Chicago	22.00 to 23.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:	
Cleveland	$0.95
Newark, N. J.	3.50
Boston	3.70
Philadelphia	3.30
Pittsburgh	.95
St. Louis	3.18
Minneapolis, St. Paul	4.54
Buffalo to:	
Albany, N. Y.	$1.26
New England (rail)	3.10
New York and Brooklyn (rail)	3.10
Virginia furnaces to:	
Philadelphia	$3.27
New England	3.77
Brooklyn, Jersey City, Newark	**3.52**
Birmingham, Ala., to:	
Boston	6.00
Cincinnati	2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
Minneapolis, St. Paul	5.85
New York (r. and w.)	6.00
Philadelphia (r. and w.)	5.25
Pittsburgh	4.90
Savannah, Ga.	2.75
St. Louis	3.40
Chicago to:	
Des Moines	$2.80
Milwaukee	.50
Minneapolis, St. Paul	2.00
Moline, Ill.	1.15
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58
Minneapolis, St. Paul	4.54
Duluth, Minn., to:	
Minneapolis-St. Paul	$1.25
Mayville, Wis.:	
Minneapolis-St. Paul	$1.75

Freight Rates, Finished Material

Pittsburgh, carloads, per 100 lbs., to:	
New York	19.5 cents
Philadelphia	18.5 cents
Boston	21.5 cents
Buffalo	16.0 cents
Baltimore	18.0 cents
Cleveland	13.5 cents
Cincinnati	17.0 cents
Chicago	21.5 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	79.0 cents
St. Louis	27 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	75 cents
Pacific coast (tin plate)	75 cents

IRON MILL USE
(Gross Tons)

Busheling, No. 1, Cleveland	29.00 to 30.00
Busheling, No. 1, Buffalo	30.00
Busheling, No. 2, Buffalo	22.00 to 24.00
Busheling, No. 1, Pittsburgh	28.00 to 29.00
Cast borings, New York	17.50
Cast borings, eastern Pa.	20.00
Cast borings, Cleveland	20.00
Cast borings, Buffalo	19.00 to 20.00
Cast borings, Pittsburgh	20.00
Cast borings, Birmingham	13.00 to 15.00
Cast borings, Chgo.	19.00 to 19.50
City wrought, long, N. Y.	31.00 to 32.00
Cut forge, Chicago	34.50 to 35.00
Forge flashings, small, Cleve.	26.50 to 27.00
Forge flashings, large, Cleve.	27.50 to 28.00
Forge No. 1, Eastern Pa.	27.50
Grate bars, Buffalo	25.00
Grate bars, Cleveland	21.50 to 22.50
Grate bars, N. J. points	21.50
Iron axles, Pittsburgh	42.00 to 44.00
Iron axles, Cincinnati	42.00 to 42.50
Iron axles, Cleveland	47.50
Iron axles, eastern Pa.	47.50
Iron axles, Chicago	47.50
Iron axles, Buffalo	45.00 to 47.00
Iron rails, Chicago	39.00 to 40.00
Iron rails, Buffalo	37.00 to 38.00
Iron rails, Cincinnati	32.00 to 32.50
Iron rails, St. Louis	34.00 to 35.00
Iron rails, Cleveland	35.00
Machine turnings, Cleve.	20.00
Machine turnings, Buffalo	18.00 to 18.50
Machine turnings, N. Y.	17.00
Machine turnings, Pitts.	20.00
Machine turnings, east. Pa.	19.50 to 20.00
Machine turnings, Birming.	17.50 to 19.00
Machine turnings, Chgo.	19.00 to 19.50
Pipes and flues, Cleveland	25.50 to 26.50
R. R. mch. cast, No. 1, Buff.	30.00
R. R. wrgt. No. 1, Buffalo	35.00
R. R. wrgt., No. 1, east, Pa.	35.00
Railroad wrgt., No. 1, Cleve.	35.00
R. R. wrought, No. 1, Pitts.	35.00
Railroad wr'ght, No. 1, Chgo.	35.00
Railroad wr'ght, No. 2, Chgo.	34.50 to 35.00
R. R. wrgt. No. 1, Birming.	29.00 to 33.00
Wrought pipe, Buffalo	29.00
Wrought pipe, eastern Pa.	30.00 to 32.00
Wrought pipe, New York	31.00

(Net Tons)

Angle bars, iron, Chicago	$38.00 to 38.50
Angle bars, steel, St. Louis	31.50 to 32.00
Arch bars & transoms, St. L.	42.00 to 42.50
Arch bars & transoms, Chgo.	39.00 to 40.00
Busheling, No. 1, Chicago	26.00 to 27.00
Busheling, No. 1, Cincinnati	24.00 to 24.50
Busheling, No. 1, St. Louis	25.50 to 26.00
Busheling, No. 2, Chicago	18.00 to 19.00
Cast borings, Cincinnati	13.00 to 13.50
Cast borings, St. Louis	16.00 to 16.50
Iron axles, St. Louis	45.00 to 45.50
Iron axles, Chicago	47.50
Machine turnings, Cinci.	13.00 to 13.50
Machine turnings, St. L.	17.25 to 17.75
Pipes and flues, Chicago	24.00 to 25.00
Pipes and flues, St. Louis	24.50 to 25.00
Railroad wrgt., No. 1, Cinci.	30.00 to 30.50
Railroad wrgt., No. 1, St. L.	31.00 to 31.25
Railroad wrgt., No. 2, St. L.	30.50 to 31.00

IRON OR STEEL WORKS USE
(Gross Tons)

Axle turnings, Cleveland	$24.00 to 25.00
Axle turnings, Buffalo	26.50 to 27.00
Shafting, New York	37.50 to 38.00
Shafting, eastern Pa.	45.00 to 47.50
Steel car axles, Birmingham	32.00 to 33.00
Steel car axles, New York	45.50 to 46.00
Steel car axles, Buffalo	45.00 to 47.00
Steel car axles, Cleveland	45.00
Steel car axles, Pittsburgh	**40.00 to 42.00**
Steel car axles, eastern Pa.	47.50
Steel car axles, Chgo.	47.50

(Net Tons)

Shafting, St. Louis	34.50 to 35.00
Steel car axles, St. Louis	43.00 to 43.50

IRON FOUNDRY USE
(Gross Tons)

Car wheels, (iron), Pitts.	$30.00
Car wheels, (steel), Pitts.	**33.00 to 35.00**
Car wheels, eastern Pa.	30.00
Car wheels, Buffalo	30.00
Car wheels, Chicago	30.00
Car wheels, St. Louis	29.50 to 30.00
Car wheels, Birmingham	25.00 to 30.00
Car wheels, Cleveland	30.00
Tram car wheels, Birming.	21.00 to 25.00
Cast, No. 1, Birmingham	26.00 to 27.00
Cast, 1, machy. N. J. points	29.50 to 30.00
Cast No. 1, Cleveland	30.00
Cast, 1, heavy, N. J. points	29.50 to 30.00
Cast, 1, machy., N. J. points	30.00
Cast No. 1 Chgo.	30.00
Cast, No. 1, Pittsburgh	28.00 to 29.00
Malleable railroad, Cincinnati	24.00 to 24.50
Malleable railroad, Cleveland	30.00
Malleable railroad, Buffalo	30.00
Malleable railroad, Pittsburgh	30.00
Malleable railroad, east. Pa.	30.00
Malleable railroad Chgo.	30.00
Malleable, agricultural, Chgo.	29.50 to 30.00

(Net Tons)

Cast, No. 1, Cincinnati	**26.00 to 26.50**
Cast, No. 1, St. Louis	24.50 to 25.00
Malleable railroad, St. Louis	26.25 to 26.75
Malleable agricultural, Chgo.	**24.00 to 25.00**
Malleable agricultural, St. L.	24.50 to 25.00

MISCELLANEOUS USES
(Gross Tons)

Reroll. rails, 5 ft. & ov., Pitts.	$35.00
Reroll. rails, 5 ft. & ov., Chgo.	35.00
Reroll. rails, 5 ft. & ov., E. Pa.	35.00
Reroll. rails, 5 ft. & ov., St. L.	34.00 to 35.00
Reroll. rails, 5 ft. or ov., Cleve.	33.00
Rerolling rails, long, Birming.	**37.50 to 38.50**
Locomotive tires, Chgo.	42.50 to 43.50

(Net Tons)

Boiler punchings, Chicago	32.00 to 33.00
Locomotive tires, St. Louis	33.50 to 34.00